

March 26, 1946.

T. H. TROLLER ET AL

2,397,169

FAN AND MOTOR STRUCTURE

Filed Dec. 6, 1943

2 Sheets-Sheet 1

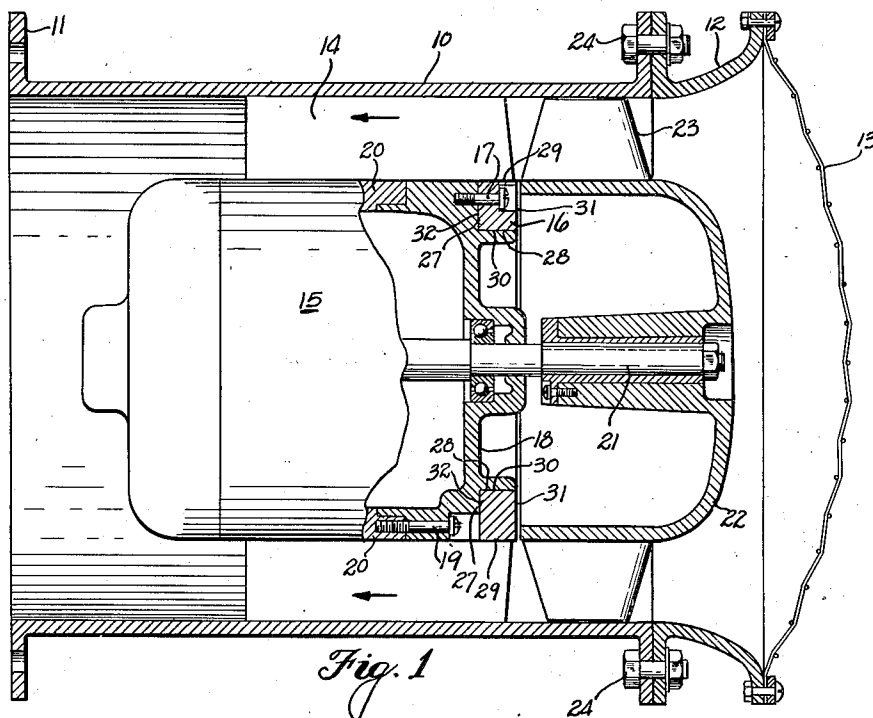


Fig. 1

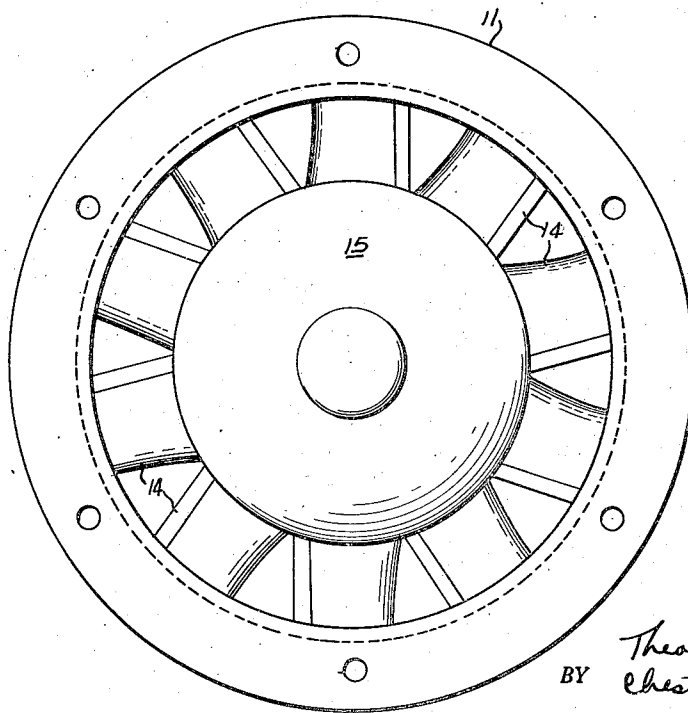


Fig. 2

INVENTORS
Theodor H. Troller
BY Chester P. Jenkins
Hoodling and Frost atty

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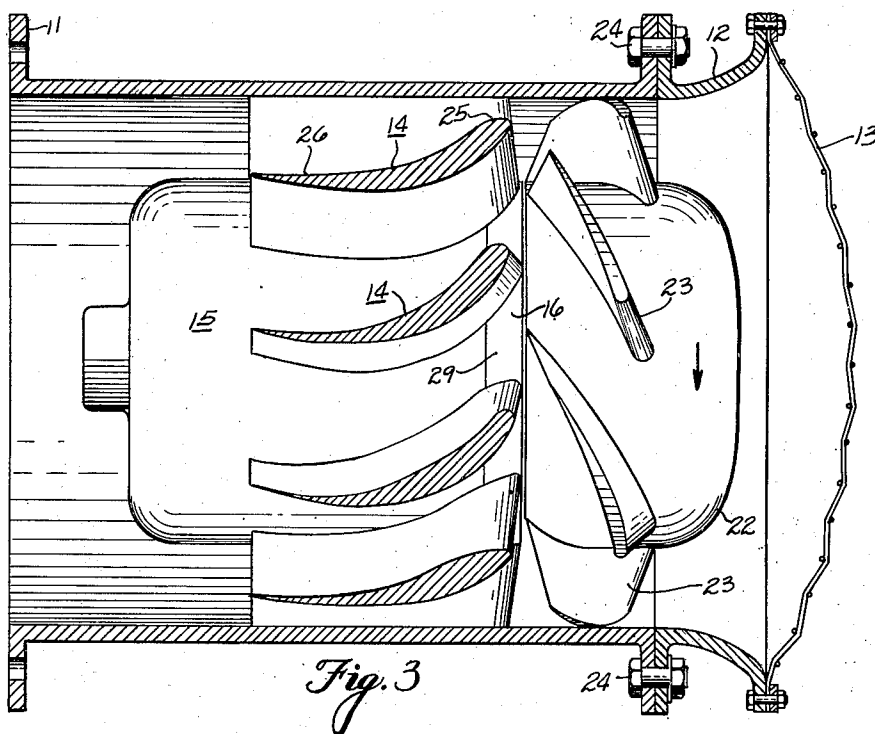


Fig. 3

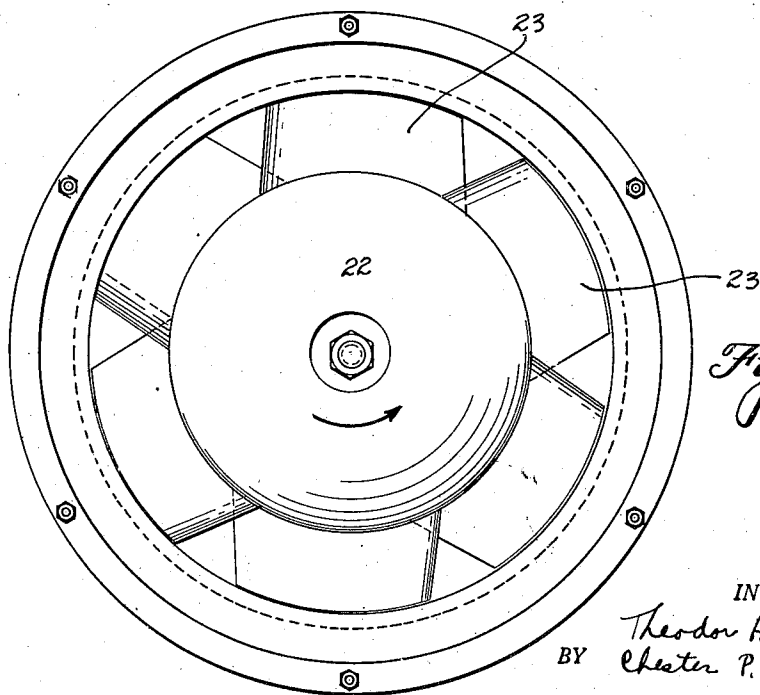


Fig. 4

INVENTORS
Theodor H. Troller
BY Chester P. Jenkins
Hoodling and Krost atty.

UNITED STATES PATENT OFFICE

2,397,169

FAN AND MOTOR STRUCTURE

Theodor H. Troller and Chester P. Jenkins, New Philadelphia, Ohio, assignors to La-Del Conveyor & Manufacturing Company, a corporation of Ohio

Application December 6, 1943, Serial No. 513,169

6 Claims. (Cl. 230—117)

The invention relates in general to a fan and motor housing and more particularly to a fan and motor housing for an axial flow fan.

An object of the invention is the provision of a fan and motor housing in which the motor and fan may be readily mounted and aligned within the housing.

In the design of certain axial flow fans, the electric motor which drives the fan may have a diameter just as large as the diameter of the fan hub. In this invention, the motors are selected as they are built by motor manufacturers and the housing of the present invention is built around the motor to obtain the best air flow requirements. Consequently, when selecting a motor, the diameter thereof may be just as large as the hub of the fan.

Therefore, an object of the invention is the provision of mounting a motor in an axial flow fan housing in which the mounting of the motor is confined within the limits of the hub of the fan, so that the mounting of the motor does not interfere with the best air flow requirements.

Another object of the invention is the provision of mounting the motor to an annular abutment guide ring which is integrally connected to the air guide vanes which in turn are connected to the outer annular wall of the axial flow fan housing.

Another object of the invention is the provision of an annular abutment guide ring having a simple-faced construction, that is, a construction having no appendages to interfere with the successful casting of the annular abutment guide ring integrally with the guide vanes which in turn are integrally connected to the outer annular wall of the axial flow fan housing.

Another object of the invention is the provision of integrally connecting the annular abutment guide ring to the inner ends of the guide vanes and at the leading edges of the vanes.

Another object of the invention is the provision of curving the leading edges of the guide vanes substantially tangentially to the forward side surface of the guide ring next adjacent to the rearward edge of the hub of the fan.

Another object of the invention is the provision of constructing each of the meeting edges of the guide vanes and the guide ring with a thickness of the same general value and of further constructing the annular abutment guide ring so that the radial depth thereof is less than the radial depth of the guide vanes.

Another object of the invention is the pro-

vision of a shoulder on the end wall of the motor which engages the annular abutment guide ring for holding the motor against longitudinal movement within the outer annular housing and for aligning the motor substantially concentric within the outer annular housing for the axial flow fan.

Another object of the invention is the provision of a fan and motor housing in which the motor and fan are so mounted and aligned within the housing that the tip clearance between the fan and the housing may be maintained at a close minimum.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a longitudinal cross-sectional view of the fan and motor housing embodying the features of the invention;

Figure 2 is a rear view of the device shown in Figure 1;

Figure 3 is a longitudinal cross-sectional view of the outside main air duct with the other parts shown in a side-elevational view; and

Figure 4 is a front view of the device shown in Figures 1 and 3.

With reference to the drawings, the fan and motor housing comprises a cast structure having an outer annular wall 10 and a plurality of air guide vanes 14 integrally connected thereto. The air guide vanes 14 are annularly spaced around the outer annular wall and extend inwardly toward the center of the housing. The inner ends of the vanes 14 receive the motor 15 which is mounted substantially concentric within the outer annular wall 10. The forward end of the outer annular wall 10 is provided with an outwardly flared portion 12 to receive the incoming air. A screen 13 may be provided on the forward end of the flared portion 12. The flared portion 12 may be integrally constructed with the outer annular wall 10, or may be constructed in a separate piece as shown, and anchored thereto by means of bolts 24. The rear end of the outer annular wall may be provided with a connecting flange 11 whereby the housing may be suitably fastened to other conducting ducts which are not shown.

The motor 15 is mounted to an annular abutment guide ring 16 which is integrally cast to the inner ends of the air guide vanes 14 at the leading edges 25 of the vanes. As shown in Figure 1, the motor has an end wall 18 connected to the cen-

trally disposed magnetic field frame 20 by means of screws 18. The end wall 18 of the motor is provided with a shoulder defined by an annular side area 27 and a cylindrical area 28. The annular abutment guide ring is a simple-faced construction in that it has no appendages and comprises an exterior surface 29, an interior surface 30, a forward side surface 31 and a rearward side surface 32. The exterior surface 29 is substantially co-extensive with the outside surface of the motor and of the fan hub 22 of the fan 23 which is mounted on the motor shaft 21. The annular side area 27 of the shoulder on the end wall of the motor abuts the rearward side surface 32 of the annular abutment guide ring and holds the motor stationary against longitudinal movement within the outer annular wall. The cylindrical area 28 of the shoulder on the end wall of the motor engages the interior surface 30 of the annular abutment guide ring and aligns the motor and the fan 23 substantially concentric within the outer annular wall 10. The annular side area 27 and the cylindrical area 28 of the shoulder on the end wall 18 of the motor, and the rearward side surface 32 and the interior surface 30 of the annular abutment guide ring may be machined to give a perfect mounting of the motor within the outer annular wall 10 to keep the tip clearance of the fan blades to a close minimum. The end wall 18 may be securely mounted in position by means of the cap screws 17 which draws the annular side area 27 of the shoulder on the end wall 18 closely against the rearward side surface 32 of the abutment guide ring. The forward side surface 31 of the annular abutment guide ring extends outwardly from the interior surface 30 and meets with the exterior surface 29. Accordingly, the annular abutment guide ring 16 is of a simple-faced construction and as such does not subject the air guide vanes 14 to any uneven stresses during the casting and the cooling of the entire cast structure which includes the outer annular wall 10, the air guide vanes 14 and the annular abutment guide ring 16. Furthermore, each of the leading edges of the air guide vanes 14 and the annular abutment guide ring have a thickness of substantially the same general value and the radial depth of the annular abutment guide ring 16 is less than that of the air guide vanes 14. The proportioning of the parts as shown in the drawings, and as explained hereinabove, greatly facilitates the casting of the outer annular wall 10, the air guide vanes 14 and the annular abutment guide ring 16 in one integral piece, while at the same time keeping the internal stresses during casting and the cooling of the casting to a minimum. The annular abutment guide ring 16 is not so large or so irregular as to set up internal stresses during the casting of the integrally connected parts. In addition, the trailing edge portions 26 of the air guide vanes 14 are likewise relieved of any internal stresses since the annular abutment guide ring 16 is suspended in a radial inward direction from the leading edge of the vanes 14, in that the construction is free of internal stresses which might tend to break or crack the annular abutment guide ring 16 away from one or more of the inner ends of the air guide vanes 14. The stress within the integrally cast air guide vanes 14 and the annular abutment guide ring 16 is further relieved by making the leading edges 25 of the air guide vanes 14 curve tangentially with respect to the forward side surface 31, where the air guide vanes are integrally connected to the annular abutment guide ring 16.

This invention contemplates the construction where the annular abutment guide ring is divided into a plurality of arcuate sections acting as lugs to hold and guide the motor within the outer annular wall. In other words, the guide ring may be continuous or dis-continuous. In the claims, the expression, "an annular abutment guide ring" includes both a continuous or dis-continuous ring.

Although we have described our invention with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. In an axial flow fan structure comprising an electric motor having a shaft and a fan mounted thereon having a hub and outwardly extending blades, the improvement of a fan and motor housing comprising a cast structure having an outer annular wall and a plurality of annularly spaced and inwardly extending vanes connected to the outer annular wall, the inner ends of the vanes receiving the motor substantially concentrically within the outer annular wall, an annular abutment guide ring connected to the inner ends of the vanes, said motor having an end wall supporting a bearing for said motor shaft, said end wall having angularly directed surfaces defining a shoulder, one of said surfaces constituting an annular side area abutting against a side of the annular abutment guide ring and the other surface constituting a cylindrical area engaging the inner surface of the annular abutment guide ring, means securing the end wall of the motor to the annular abutment guide ring for holding the motor against longitudinal movement and aligning the motor substantially concentrically within the outer annular wall, the external surface of the annular abutment guide ring substantially coinciding with the external surface of the motor and of the nose-like hub of the fan.

2. In an axial flow fan structure comprising an electric motor having a shaft and a fan mounted thereon having a hub and outwardly extending blades, the improvement of a fan and motor housing comprising a cast structure having an outer annular wall and a plurality of annularly spaced and inwardly extending vanes integrally connected to the outer annular wall, the inner ends of the vanes receiving the motor substantially concentrically within the outer annular wall, an annular abutment guide ring integrally connected to the inner ends of the vanes, said guide ring having an exterior surface, an interior surface, a first annular side surface and a second annular side surface, said motor having an end wall supporting a bearing for said motor shaft, said end wall having angularly directed surfaces defining a shoulder, one of said shoulder surfaces constituting an annular side area abutting against the first annular side surface of the guide ring and the other shoulder surface constituting a cylindrical area engaging the interior surface of the guide ring, means securing the end wall of the motor to the guide ring for holding the motor against longitudinal movement and aligning the motor substantially concentrically within the outer annular wall, the external surface of the guide ring substantially coinciding with the external surface of the motor and the nose-like hub

of the fan, said second annular side surface of the guide ring extending outwardly from the interior surface and meeting with the exterior surface.

3. In an axial flow fan structure comprising an electric motor having a shaft and a fan mounted thereon having a hub and outwardly extending blades, the improvement of a fan and motor housing comprising a cast structure having an outer annular wall and a plurality of annularly spaced and inwardly extending vanes integrally connected to the outer annular wall, the inner ends of the vanes receiving the motor substantially concentrically within the outer annular wall, an annular abutment guide ring integrally connected to the inner ends of the vanes, said guide ring having an exterior surface, an interior surface, a first annular side surface and a second annular side surface, said motor having an end wall supporting a bearing for said motor shaft, said end wall having an annular side area abutting against the first annular side surface of the guide ring, means securing the end wall of the motor to the annular abutment guide ring for holding the motor against longitudinal movement and aligning the motor substantially concentrically within the outer annular wall, the external surface of the annular abutment guide ring substantially coinciding with the external surface of the motor and the nose-like hub of the fan, said interior surface and said first annular side surface of the guide ring angularly intersecting each other, said second annular side surface of the guide ring extending outwardly from the interior surface and meeting with the exterior surface.

4. In an axial flow fan structure comprising an electric motor having a shaft and a fan mounted thereon having a hub and outwardly extending blades, the improvement of a fan and motor housing comprising a cast structure having an outer annular wall and a plurality of annularly spaced and inwardly extending vanes integrally connected to the outer annular wall, the inner ends of the vanes receiving the motor substantially concentrically within the outer annular wall, an annular abutment guide ring integrally connected to the inner ends of the vanes and at the leading edges thereof, said guide ring having an exterior surface, an interior surface, a first annular side surface and a second annular side surface, said motor having an end wall supporting a bearing for said motor shaft, said end wall having an annular side area abutting against the first annular side surface of the guide ring, means securing the end wall of the motor to the annular abutment guide ring for holding the motor against longitudinal movement and aligning the motor substantially concentrically within the outer annular wall, the external surface of the annular abutment guide ring substantially coinciding with the external surface of the motor and the nose-like hub of the fan, said interior surface and said first annular side surface of the guide ring angularly intersecting each other, said second annular side surface of the guide ring extending outwardly from the interior surface and meeting with the exterior surface.

5. In an axial flow fan structure comprising an electric motor having a shaft and a fan mounted thereon having a hub and outwardly

extending blades, the improvement of a fan and motor housing comprising a cast structure having an outer annular wall and a plurality of annularly spaced and inwardly extending vanes integrally connected to the outer annular wall, the inner ends of the vanes receiving the motor substantially concentrically within the outer annular wall, an annular abutment guide ring integrally connected to the inner ends of the vanes and at the leading edges thereof, said guide ring having an exterior surface, an interior surface, a first annular side surface and a second annular side surface, said motor having an end wall supporting a bearing for said motor shaft, said end wall having an annular side area abutting against the first annular side surface of the guide ring, means securing the end wall of the motor to the annular abutment guide ring for holding the motor against longitudinal movement and aligning the motor substantially concentrically within the outer annular wall, the external surface of the annular abutment guide ring substantially coinciding with the external surface of the motor and the nose-like hub of the fan, said interior surface and said first annular side surface of the guide ring angularly intersecting each other, said second annular side surface of the guide ring extending outwardly from the interior surface and meeting with the exterior surface, said leading edges being curved tangentially with respect to the second annular side surface of the guide ring where they are integrally connected to the guide ring.

6. In an axial flow fan structure comprising an electric motor having a shaft and a fan mounted thereon having a hub and outwardly extending blades, the improvement of a fan and motor housing comprising a cast structure having an outer annular wall and a plurality of annularly spaced and inwardly extending vanes integrally connected to the outer annular wall, the inner ends of the vanes receiving the motor substantially concentrically within the outer annular wall, an annular abutment guide ring integrally connected to the inner ends of the vanes and at the leading edges thereof, said guide ring having an exterior surface, an interior surface, a first annular side surface and a second annular side surface, said motor having an end wall supporting a bearing for said motor shaft, said end wall having an annular side area abutting against the first annular side surface of the guide ring, means securing the end wall of the motor to the annular abutment guide ring for holding the motor against longitudinal movement and aligning the motor substantially concentrically within the outer annular wall, the external surface of the annular abutment guide ring substantially coinciding with the external surface and said first annular side surface of the guide ring angularly intersecting each other, said second annular side surface of the guide ring extending outwardly from the interior surface and meeting with the exterior surface, each of the leading edges of the vanes and the guide ring having a thickness of substantially the same general value and the radial depth of the guide ring being less than that of the vanes.

THEODOR H. TROLLER.
CHESTER P. JENKINS.