

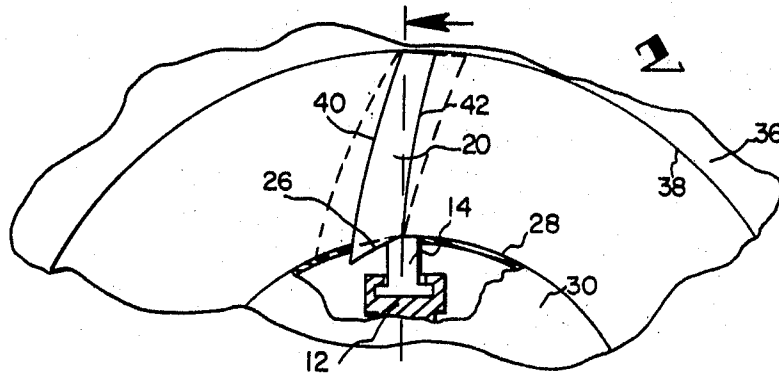
July 22, 1969

T. H. TROLLER

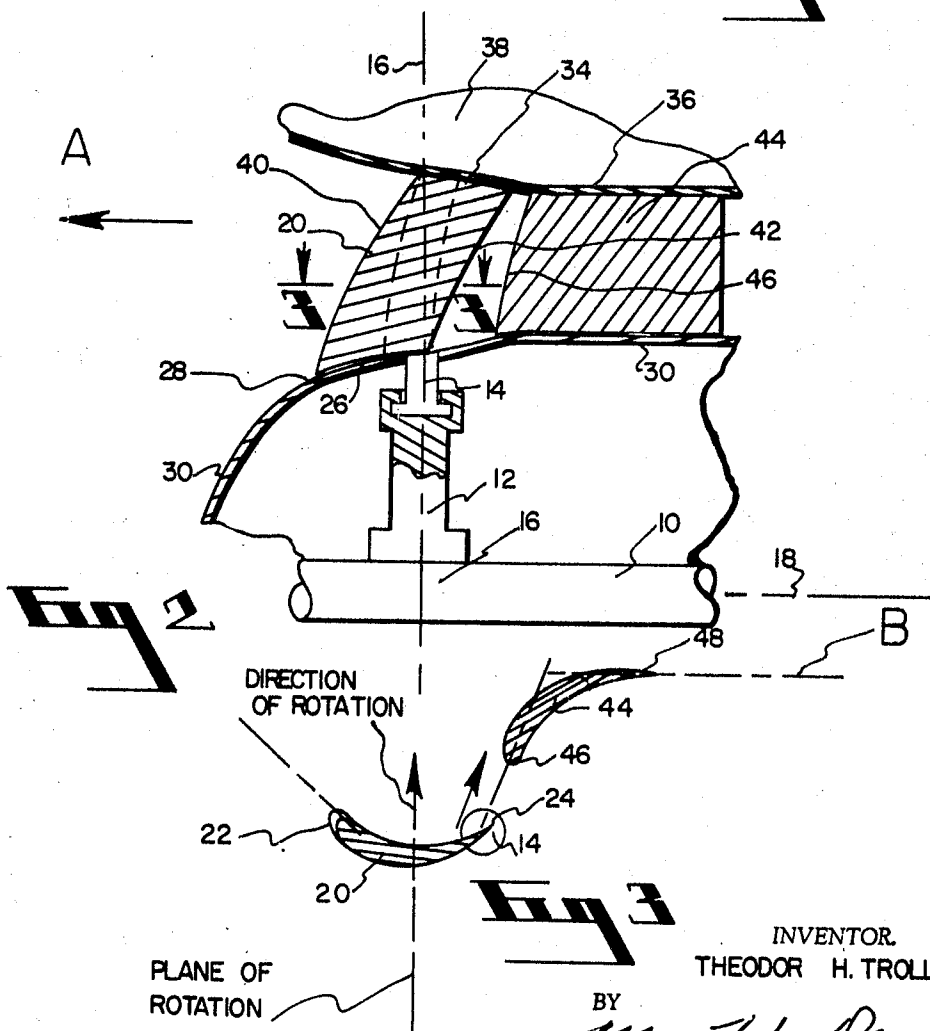
3,456,872

PITCH ADJUSTABLE AXIAL FLOW BLOWER

Original Filed March 18, 1966



2 Aug 1



INVENTOR.
THEODOR H. TROLLER

BY
Wm. H. Dean

1

3,456,872

PITCH ADJUSTABLE AXIAL FLOW BLOWER

Theodor H. Troller, Ava Ranch, Portal, Ariz. 85632

Continuation of application Ser. No. 545,783, Mar. 18, 1966, which is a continuation-in-part of application Ser. No. 441,110, Mar. 19, 1965, which in turn is a continuation-in-part of application Ser. No. 254,114, Jan. 28, 1963, both now abandoned. This application Dec. 19, 1967, Ser. No. 710,415

(Filed under Rule 47(b) and 35 U.S.C. 118)

Int. Cl. F04d 27/00, 19/00, 29/36

U.S. Cl. 230—114

4 Claims

ABSTRACT OF THE DISCLOSURE

A pitch adjustable axial flow blower having a constricted fluid flow passageway across the blades thereof, wherein the blades may be pitch adjusted while maintaining close tolerances between their roots and tips and their respective adjacent rotor and outer housing surfaces.

This application is a continuation of application Ser. No. 545,783, filed Mar. 18, 1966, now abandoned, which is a continuation-in-part of application Ser. No. 441,110, filed Mar. 19, 1965, now abandoned, which was a continuation-in-part of application Ser. No. 254,114, filed Jan. 28, 1963, now abandoned.

Briefly, the axial flow blower of the present invention includes a rotor member spaced from a housing member to define a fluid flow passageway therebetween, with the rotor member supporting a plurality of circumferentially spaced pitch adjustable axial flow blades. The surface of the rotor in the region where the blades are carried conforms generally to a zone of a sphere, which sphere has its center point on the axis of rotation of the rotor member. The blades extend radially outwardly from the rotor member to adjacent the inner wall surface of the housing member, which inner wall surface converges with respect to the axis of the rotor member. Thus, a constricted flow passageway is provided across the blades, with the trailing edge tip of the blades being closer to the axis of the rotor member than is the leading edge tip of the blades. The roots of the blade are conformed to the spherical rotor surface, while the tips of the blades conform to their adjacent inner wall housing surface. The preferred embodiment provides a spherical inner housing surface, and this, together with the spherical rotor surface mentioned, permits pitch adjustment of the blades while maintaining a uniform tolerance between the root and tips and their respective rotor and housing surfaces.

Various advantages of the present invention will become apparent upon consideration of the following description and drawings, in which:

FIG. 1 is a fragmentary inlet end view of an adjustable pitch axial flow blower embodying the principles of the present invention, with portions broken away and in section to amplify the illustration;

FIG. 2 is a fragmentary sectional view taken along the lines 2—2 of FIG. 1; and

FIG. 3 is an enlarged fragmentary sectional view taken along the lines 3—3 of FIG. 2, showing the arrangement of the blading of the present invention.

Referring now to the drawings wherein like reference numerals refer to like parts throughout the various figures, there is illustrated an axial flow blower embodying the principles of the present invention, having an elongated rotor shaft member 10 adapted to be driven by well known means about an axis of rotation 18. An elongated hollow rotor housing 30 is fixed to the rotor shaft 10 and is coaxially spaced therefrom. The forward portion of the

2

rotor housing 30 is closed and has a familiar bullet nose shape diverging with respect to the axis of rotation 18 to a generally parallel surface, as is well known in the art. A hub member 12 is fixed to the outer surface of the rotor shaft member 10 at the forward portion thereof, which hub member has a longitudinal axis extending radially from the rotor shaft member 10. The upper end portion of the hub member 12 is adapted to rotatably receive a shank portion 14 of a blade 20. The shank portion 14 may be rotated about an axis 16 by any well-known means, and likewise, any well known means may be provided for locking the shanks in a desired position. By rotating the shank portion 14 the blades 20 may be pitch adjusted between any limits desirable. Coaxial with the rotor shaft member and spaced laterally outwardly therefrom is an elongated hollow open ended housing member 36 having a forward or inlet portion which converges rearwardly with respect to the rotor shaft member 10. The housing member 36 and rotor housing 30 define a fluid flow passageway therebetween.

The rotor housing 30 has a circumferential segment generally designated 28 about its outer periphery, which segment has a shape conforming to a zone of a sphere. The sphere from which such zone is taken has its center point on the axis of rotation 18. The housing member 36 has a circumferential region in the inner surface thereof of which region is generally designated 38 and is spaced longitudinally rearwardly with respect to the segment 28 of rotor housing 30. That is, the upstream end portion of the region 38 of housing member 36 is spaced just downstream of the downstream end of segment 28 of rotor housing 30. The circumferential region 38 of housing member 36 has a shape conforming to a zone of a sphere, which sphere has its center point coincident with the center point of the sphere forming the segment 28 of rotor housing 30. The respective segment 28 and region 38 thus form a constricting or converging fluid flow passageway therebetween.

A plurality of circumferentially spaced blades 20 (one of which is shown) is arranged about the rotor housing 30, and as previously mentioned, the blades 20 are pitch adjustable about the axis 16 of shank portion 14. Each blade 20 is of an impulse configuration and has a leading edge 22 directed at an angle to the plane of rotation and generally in the direction of rotation, a trailing edge 24 pointed at an angle to the plane of rotation and generally in the direction of rotation, a root 26 and a tip 34. The root 26 of each blade extends axially over a portion of the segment 28 of the rotor housing 30, which root 26 is closely adjacent segment 28 and conforms to the spherical shape thereof. The tip 34 of each blade 20 extends across a portion of the region 38 of housing 36, which tip 34 is closely adjacent the region 38 and conforms to the spherical shape thereof. The leading edge 22 and trailing edge 24 extend from root 26 and tip 34 in a rearwardly longitudinally disposed inclination. The shank portion 14 of the blade 20 is fixed at the trailing edge portion of the root 26, with the longitudinal axis 16 of such shank portion 14 extending radially upwardly from shaft member 10 to the leading edge portion of tip 30. By arranging the shank portion 14 in this manner, the blade 20 maintains a substantial stress carrying capability cross section from its root 26 to its respective tip 34 in the proximity of its pivotal axis 16. With the blade 20 arranged as described, the trailing edge portion of tip 34 is closer to the axis of rotation 18 of shaft member 10 than is the leading edge portion of tip 34. With the shank portion 14 arranged at the trailing edge portion of the root 26 as described, the blade 20 may be pitch adjusted while maintaining close tolerance between the root 26 and the segment 28 of rotor housing 30 and the tip 34 and region

38 of housing member 36. Since the trailing edge tip 34 is closer to the axis of rotation 18 of shaft member 10 than is the leading edge tip 34 the entire assembly of shaft member 10, housing 30, and blades 20 may be removed longitudinally outwardly in the direction of arrow A from the housing member 36, and the blades 20 adjusted in pitch and the assembly returned to within the confines of housing member 36, with the root and tip 34 tolerance being maintained between their respective segment 28 and region 38.

A plurality of stators 44 extending circumferentially about an inner surface region of the housing member 36, extends radially downwardly from the housing 36 to adjacent the outer surface of rotor housing 30. The stators 44 (one of which is shown) have inlet edges 46 which are spaced from the trailing edges 24 of blades 20 and in the direction of fluid flow as shown by the flow direction arrow in FIG. 3. Each stator 44 is provided with an outlet edge 48 pointed substantially in a direction axially or parallel to the axis of rotation 18 of shaft member 10 as indicated by line B of FIG. 3 of the drawings.

By making the fluid flow passageway converging with respect to each blade 20 from its leading edge 22 to its trailing edge 24, such converging passageway is particularly cooperable with axial flow blades wherein restriction of the passageway is compatible with an increase of velocity normally attendant the operation of impulse blading, illustrated, and that the converging passageway together with the trailing edge portion of tip 34 being disposed closer to the axis of rotation 18 than the leading edge portion of the tip 34 further permits a removal of the rotor assembly without interfering with the root and tip tolerances between the respective rotor and housing surfaces.

It can be appreciated that segment 38 of rotor housing 30 may take a shape conforming only generally or approximately to a zone of a sphere. The same can be said for region 38 of housing 36 where it is desired that such region is to be spherical. For example, under certain well known circumstances it is highly impractical to machine a spherical surface, and in these cases a plurality of truncated conical sections could be machined with the general outline of either segment 28 and/or region 38 so machined being spherical. Other machining variations whereby segment 28 and/or region 38 approximate a zone of a sphere could be readily applied without departing from the scope of the present invention.

Having described the preferred embodiment of my present invention and in accordance with the patent statutes, it is to be realized that modifications may be made without departing from the broad scope of the invention. Accordingly, it is respectfully requested that the scope of this invention not be restricted to this specific form shown

for uses mentioned except to the extent indicated in the appended claims.

What is claimed is:

1. An axial flow blower comprising: a first member symmetrical about an elongated central axis and having intermediate the ends thereof a circumferential segment the surface of which conforms generally to a zone of a sphere; a tubular housing member having an upstream inlet and a downstream outlet and spaced coaxially laterally outwardly from said first member to define a fluid flow passageway therebetween, said housing member having intermediate said outlet and inlet an inner circumferential region the surface of which conforms generally in shape to a zone of a sphere having the centerpoint thereof on said central axis and said region converging in a downstream direction and located generally radially opposite said segment with all inner portions of said housing member upstream of said region being radially spaced from said central axis a magnitude at least equal to the magnitude of maximum radial spacing of said region from said central axis; and a plurality of pitch adjustable circumferentially spaced blades extending radially outwardly from closely adjacent said segment to closely adjacent said region, said blades having root portions with the base surfaces thereof generally conforming in shape to said surface of said segments, and said blades having tip portions with the end surfaces thereof generally conforming in shape to said surface of said region.

2. An axial flow blower as set forth in claim 1 wherein said surface of said segment and said surface of said region have coincident centerpoints.

3. An axial flow blower as set forth in claim 1 wherein said blades from said root portions to said tip portions have rearwardly inclined leading and trailing edges.

4. An axial flow blower as set forth in claim 1 wherein said blades have leading and trailing edges of which the outer end points are located downstream of the inner end points.

References Cited

UNITED STATES PATENTS

2,382,535	8/1945	Bauer.	
2,084,111	6/1937	Schicht	230—120
3,143,384	8/1964	Lindsjo et. al.	230—120

FOREIGN PATENTS

949,899	9/1956	Germany.
505,078	5/1939	Great Britain.

HENRY F. RADUAZO, Primary Examiner

U.S. CI. X.R.

230—120, 134