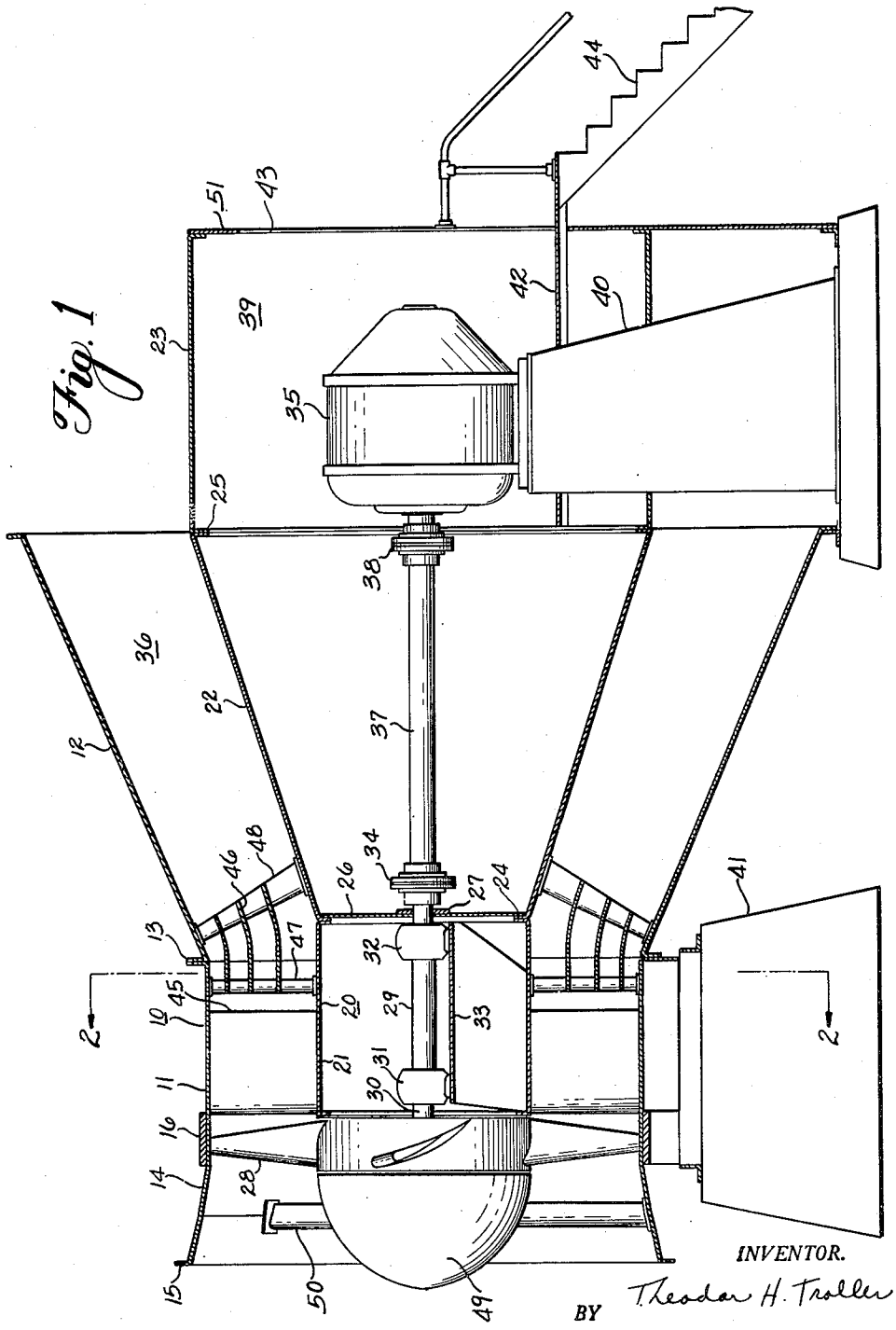
Jan. 16, 1951 T. H. TROLLER 2,538,739

HOUSING FOR FAN AND MOTOR

Filed March 27, 1946 2 Sheets-Sheet 1

Fig. 1



INVENTOR.
Theodor H. Troller
BY
Spradling and Kroat
attys

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Filed March 27, 1946 2 Sheets-Sheet 2

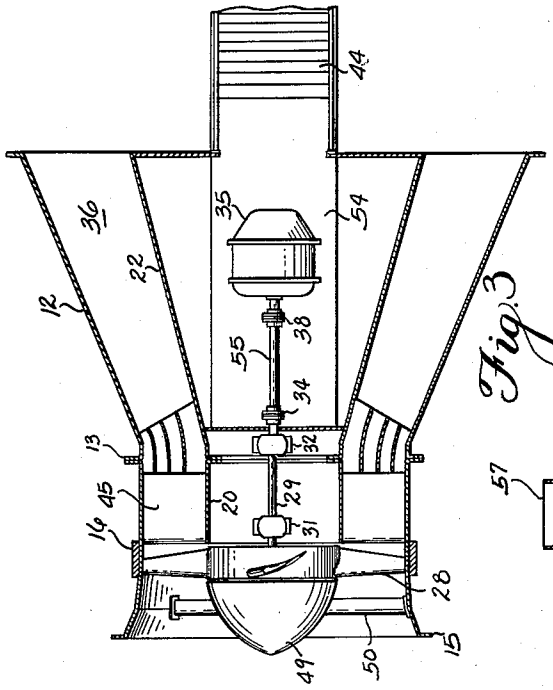


Fig. 3

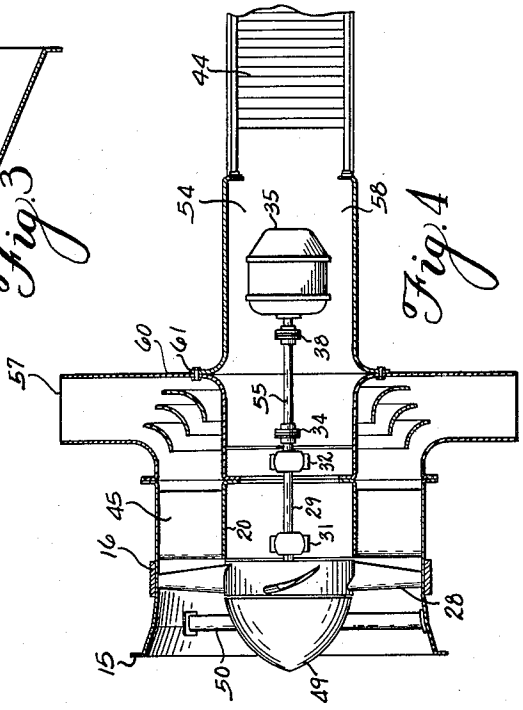


Fig. 4

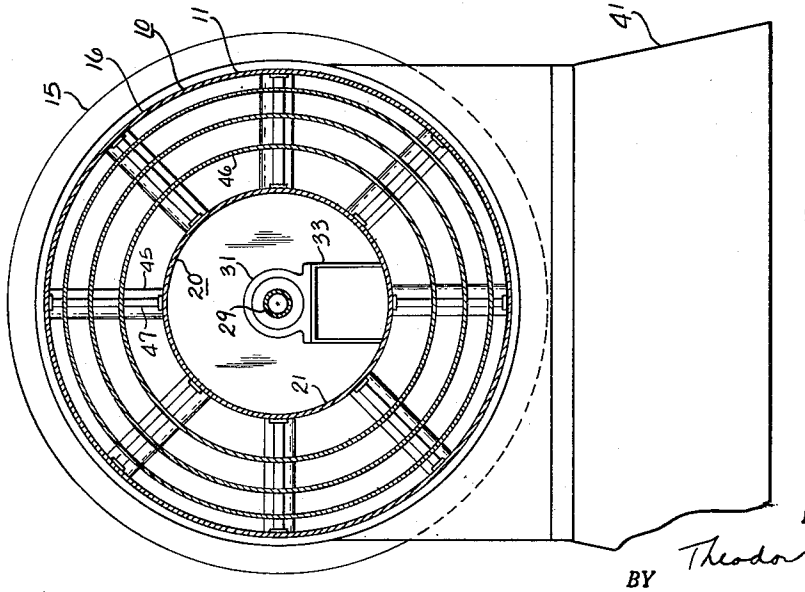


Fig. 2

INVENTOR.
Theodor H. Troller
BY
Woodling and Kost
attys.

Patented Jan. 16, 1951 2,538,739

UNITED STATES PATENT OFFICE

2,538,739

HOUSING FOR FAN AND MOTOR

Theodor H. Troller, New Philadelphia, Ohio, assignor to Joy Manufacturing Company, a corporation of Pennsylvania

Application March 27, 1946, Serial No. 657,457

7 Claims. (Cl. 230—117)

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My invention relates to fans and more particularly to ventilating fans of the axial flow type, and my invention finds utility for ventilating mines or other places.

An object of my invention is the provision of a housing for an axial flow fan as well as for the power driving unit which drives the fan.

Another object of my invention is the provision of a diffuser for an axial flow fan in the form of an annular duct having an increasing cross-sectional area.

Another object of my invention is the provision of a fan chamber which is connected in communication with an annular duct, the forward portion of said duct having stationary guide vanes for directing the air into the rearward portion thereof which flares outwardly to produce an increasing cross-sectional area and which functions as a diffuser for the fan.

Another object of my invention is the provision of an inner housing and an outer duct surrounding the inner housing and defining therewith an annular passage, the inner housing constituting an enclosure for housing the driving unit and the shaft which drives the fan.

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

Figure 1 is a longitudinal, vertical sectional view of a mine ventilating fan embodying the features of my invention and illustrating a cone-like annular diffuser.

Figure 2 is a cross-sectional view taken along the line 2—2 of Figure 1;

Figure 3 is a modification of the invention shown in Figures 1 and 2, in that the power driving unit is mounted within the housing which defines the inner surface of the diffuser; and

Figure 4 is a modification of Figure 3, in that the diffuser extends substantially radially outwardly instead of extending rearwardly in the form of the cone-like annular duct in Figure 3.

With reference to Figures 1 and 2, my axial flow fan structure comprises an outer duct 10 having a fan chamber in the forward end thereof for a fan 28, an inner housing 20 disposed substantially concentrically of the outer duct 10 and defining therewith, in rear of the fan chamber, an annular passage which terminates in a diffuser 36. The inner housing terminates in an enclosure 39 in which a power driving unit or electric motor 35 is mounted for driving the fan. Although I have shown an electric motor as a

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power driving unit, it is to be understood that any suitable driving unit may be employed other than an electric motor. The outer duct 10 comprises a forward section or portion 11 and a rearward section or portion 12 which may be joined together by a suitable flange connection at 13. The inner housing 20 comprises a forward section or portion 21, an intermediate section or portion 22, and a rear section or portion 23. The forward section 21 and the intermediate section 22 may be suitably joined together as, for example, by the flange juncture at 24. The rearward section 23 and the intermediate section may be joined together as, for example, by the flange juncture 25. A partition 26 separates the intermediate section 22 from the forward section 21. The intermediate section 22 and the rearward section 23 define the enclosure 39 in which the motor 35 may be mounted upon a suitable stand 40 which rests upon the ground or floor and projects upwardly into the enclosure 39. The enclosure 39 may have an entrance opening 43 through which the operator may gain access to the enclosure for inspecting and maintaining the power driving unit and other working parts. The entrance opening 43 may be closed by means of a suitable door hinged to the back wall 51 of the rearward section 23. Mine ventilating fans of the present type are usually quite large and the horizontal center line of the motor may be as much as 10 to 12 feet above the ground support level, and thus I provide steps 44 leading up to the motor enclosure 39. A platform 42 may be provided within the enclosure to facilitate the operator's walking around the power driving unit 35. The forward end of the fan structure may be supported by a fan housing stand 41 which rests upon the earth or floor. The forward section 11 of the duct 10 has an axial extension portion 14 which extends in advance of the forward end of the inner housing and provides a fan chamber. The ends of the blades for the fan 28 make a close tip clearance with the inside surface of the axial extension portion 14. In order that a close tip clearance may be constantly retained, I provide for reinforcing that part of the axial extension portion 14 which is axially co-extensive with the fan by means of a reinforcing band 16 which is constructed of heavier material than that of which the extension portion 14 is constructed. The reinforcing band 16 may comprise any suitable construction so that the inner surface of the axial extension portion 14 in which the fan revolves may be maintained rigid and in a fixed position, or of

true diameter so that the tip clearance of the fan may be maintained relatively small. The forwardmost end of the axial extension portion 14 may be provided with a flange 15 whereby the axial flow fan structure may be connected to a duct system that leads down into the mine which is to be ventilated.

The mine which is to be ventilated is provided with a duct arrangement which leads out to the top of the ground, and the present invention is arranged to be connected to the mine duct system for exhausting air from the mine, and the connection to the mine duct system may be made at the flange 15. Mounted in advance of the fan, is a stationary nose 49 which is held substantially central of the fan chamber by means of outwardly extending braces 50 which have their outer ends connected to the inside surface of the axial extension portion 14 and which have their inner ends connected to the stationary nose 49. The fan revolves between the rear side of the nose 49 and the forward end of the inner housing 20. The forward section 21 of the inner housing and the forward section 11 of the outer duct define substantially a straight annular passage immediately in rear of the fan chamber. Mounted within the straight annular passage are a plurality of stationary vanes 45 which extend substantially radially across the straight annular duct defined by the forward section 11 of the outer duct and the forward section 21 of the inner housing. The stationary vanes 45 have their outer ends connected to the inside surface of the forward section 11 of the outer duct and have their inner ends connected to the outside surface of the forward section 21 of the inner housing. The stationary vanes besides functioning as air guide vanes, also support the forward section 21 of the inner housing within the forward section 11 of the outer duct. Immediately in the rear of the stationary vanes 45 are a plurality of annularly disposed baffles 46 which are supported by means of braces 47 and 48. The outer ends of the braces are connected to the inside surface of the outer duct and the inner ends of the braces are connected to the outside surface of the inner housing.

The baffles 46 may be concentrically spaced apart and are adapted to direct the flow of the air in the diffuser 36 which is in the form of a cone-like annular passage defined by the rearward section 12 of the outer duct and the intermediate section 22 of the inner housing. The fan is driven by a driving shaft 29 rotatably mounted within spaced bearings 31 and 32 carried by a bearing bracket 33 which is fastened to the bottom surface of the inside of the forward section 21 of the inner housing. The left-hand end of the driving shaft 29 is provided with a shaft extension 30 which extends forwardly of the inner housing 20 and projects into the fan housing for rotating the fan. A shaft seal 27 surrounds the driving shaft 29 where it passes through the partition 26 in order to seal the forward section 21 of the inner housing from the intermediate section 22 and the rearward section 23. A coupling shaft 37 has couplings 34 and 38 on the end thereof and interconnects the driving shaft 29 to the shaft of the motor 35.

In operation, the fan 28 when rotated by the motor 35 draws air from the mine which is to be ventilated into the fan chamber in which the fan revolves. The air then is forced rearwardly into the straight annular space between the forward section 11 of the outer duct and the forward section 21 of the inner duct. The stationary vanes 45 operate to guide the air through the straight annular passage portion after which the air then passes through the space between the concentrically spaced baffles 46, whereupon the air enters the diffuser 36 in the form of an annular cone-like duct. The air upon leaving the diffuser 36 is materially slowed down before it is exhausted into atmosphere. The motor enclosure 39 which is defined by the rearward section 23 of the inner housing, is a relatively tight structure so that the exhaust air which may contain fumes or mine gases cannot enter the motor enclosure.

In Figure 3, I show a modification of Figures 1 and 2 in that the motor 35 is mounted on a platform 54 within the intermediate section 22 of the inner housing. In this modification, the coupling shaft which is now identified by the reference character 55, is somewhat shortened as compared with the coupling shaft shown in Figure 1. Otherwise, the operation of the unit shown in Figure 3 is substantially the same as that for Figures 1 and 2.

In Figure 4, the diffuser which is identified by the reference character 57, extends substantially radially outward, in which event, the motor 35 is mounted on the platform 54 which may be enclosed in a compartment 58 constituting a rearward extension of the inner housing 20. The compartment 58 may be connected to the rearward side 60 of the diffuser 57 by a flange 61.

Although I have described my invention in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form 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. An axial flow fan structure comprising a first chamber, a second chamber, and a third chamber, a fan mounted in the first chamber for moving air through said second and third chambers, said second chamber being located immediately in rear of the first chamber and comprising an annular duct, said third chamber being located immediately in rear of the second chamber and defining a radially disposed annular duct of expanding cross-sectional area of which the outer peripheral portion is bounded by planes substantially perpendicular to the axis of said axial flow, said radially disposed annular duct throughout its circumference opening freely directly to the atmosphere and constituting a diffuser for the axial flow fan, and power driving means for driving said fan.

2. An axial flow fan structure comprising portions defining a first chamber, a second chamber, and a third chamber, a fan mounted in said first chamber for moving air through said second and third chambers, said second chamber being located immediately in rear of the first chamber and constituting an annular duct and said third chamber being located immediately in rear of the second chamber and defining a radially disposed annular duct of which the outer peripheral portion is bounded by planes substantially perpendicular to the axis of said axial flow, said radially disposed annular duct constituting a diffuser for the axial flow fan, power driving means for driving said fan, and circular guide

vanes for guiding the air leaving the second chamber into coaxial paths in said third chamber.

3. An axial flow fan structure comprising portions defining a first chamber, a second chamber, and a third chamber, a fan mounted in said first chamber for moving air through said second and third chambers, said second chamber being located immediately in rear of the first chamber and constituting an annular duct and said third chamber being located immediately in rear of the second chamber and defining a radially disposed annular duct of which the outer peripheral portion is bounded by planes substantially perpendicular to the axis of said axial flow, said radially disposed annular duct constituting a diffuser for the axial flow fan, power driving means for driving said fan, and circular guide vanes of different diameters, and differently spaced axially of said fan structure, for directing the flow of air into said third chamber.

4. An axial flow fan structure comprising portions defining a first chamber, a second chamber, and a third chamber, a fan mounted in said first chamber for moving air through said second and third chambers, said second chamber being located immediately in rear of the first chamber and constituting an annular duct and said third chamber being located immediately in rear of the second chamber and defining a radially disposed annular duct of which the outer peripheral portion is bounded by planes substantially perpendicular to the axis of said axial flow, said radially disposed annular duct constituting a diffuser for the axial flow fan, power driving means for driving said fan, and coaxial circular guide vanes of different diameters, and curved on axial planes, having their portions of maximum diameter in planes differently axially spaced of said third chamber.

5. In an axial flow fan structure, a portion defining a first chamber, a portion defining a second chamber immediately behind the first chamber and having a substantially constant cross-sectional area throughout its length for the flow of air, a third chamber immediately behind the second chamber and defining a radially disposed annular duct opening freely to the atmosphere throughout its circumference and having its outer peripheral portion bounded by planes substantially perpendicular to the axis of said axial flow, a fan rotatably mounted in the first chamber for moving air through the second and third chambers, and power driving means connected to drive the fan.

6. In an axial flow fan structure, a portion defining a first chamber, a portion defining a second chamber immediately behind the first chamber and having a substantially constant cross-sectional area throughout its length for the flow of air, a third chamber immediately behind the second chamber and defining a radially disposed annular duct of which the outer peripheral portion is bounded by planes substantially perpendicular to the axis of said axial flow, a fan rotatably mounted in the first chamber for moving air through the second and third chambers, circular guide vanes for guiding the air leaving the second chamber, and power driving means connected to drive the fan.

7. In an axial flow fan structure, a portion defining a first chamber, a portion defining a second chamber immediately behind the first chamber and having a substantially constant cross-sectional area throughout its length for the flow of air, a third chamber immediately behind the second chamber and defining a radially disposed annular duct of which the outer peripheral portion is bounded by planes substantially perpendicular to the axis of said axial flow, a fan rotatably mounted in the first chamber for moving air through the second and third chambers, coaxially arranged circular guide vanes, curved on axial planes, for guiding the air leaving the second chamber, and power driving means connected to drive the fan.

THEODOR H. TROLLER.

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