

July 6, 1943.

M. B. CURLEY ET AL

2,323,456

VENTILATOR

Filed July 12, 1940

2 Sheets-Sheet 1

Fig. 1

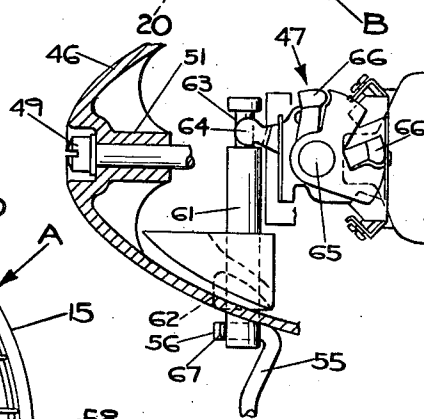
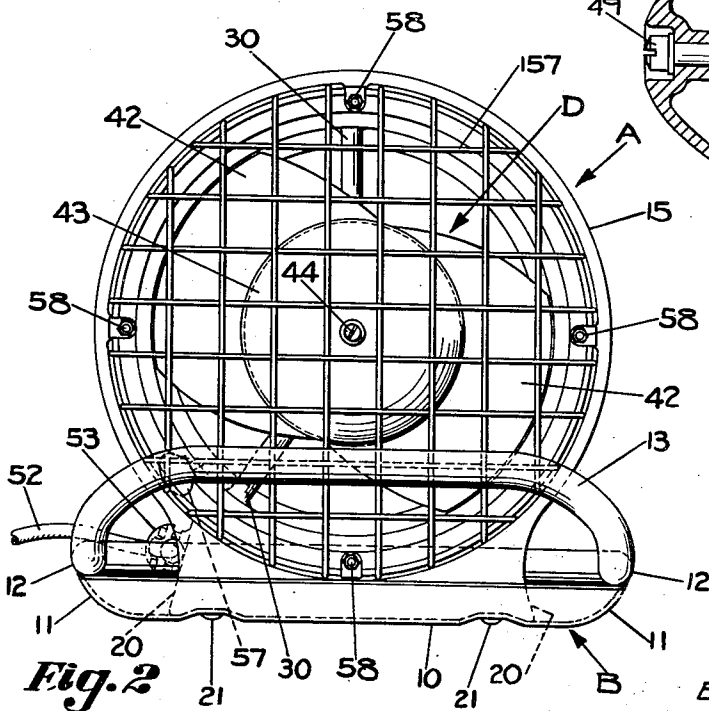
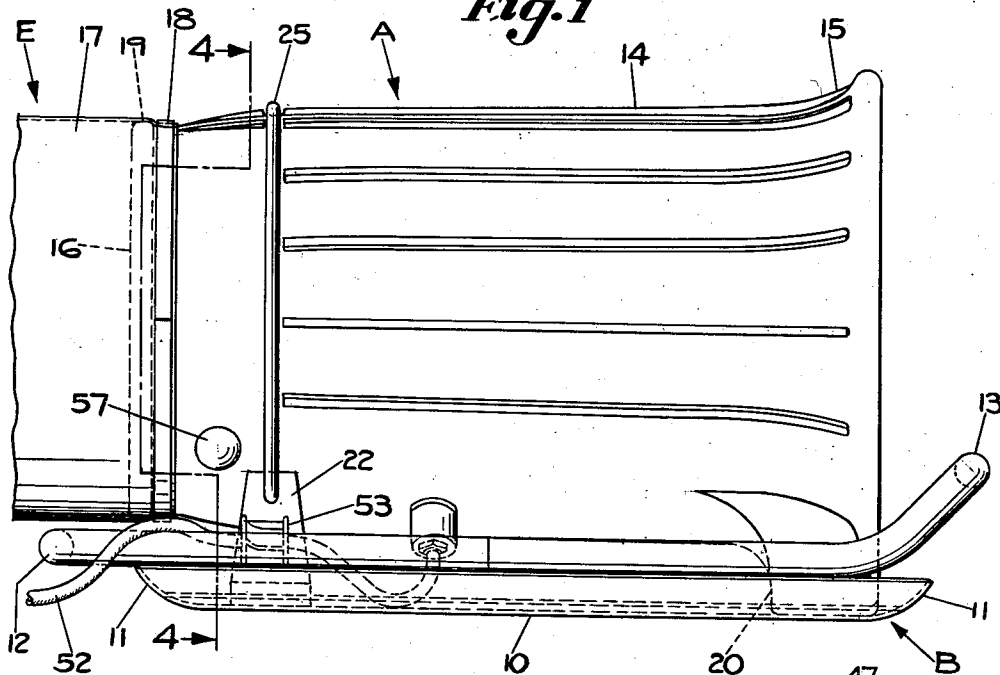


Fig. 6

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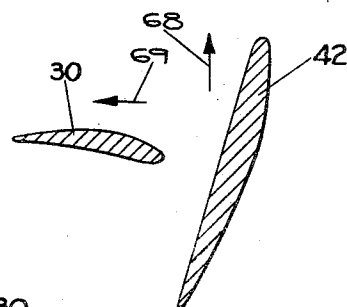
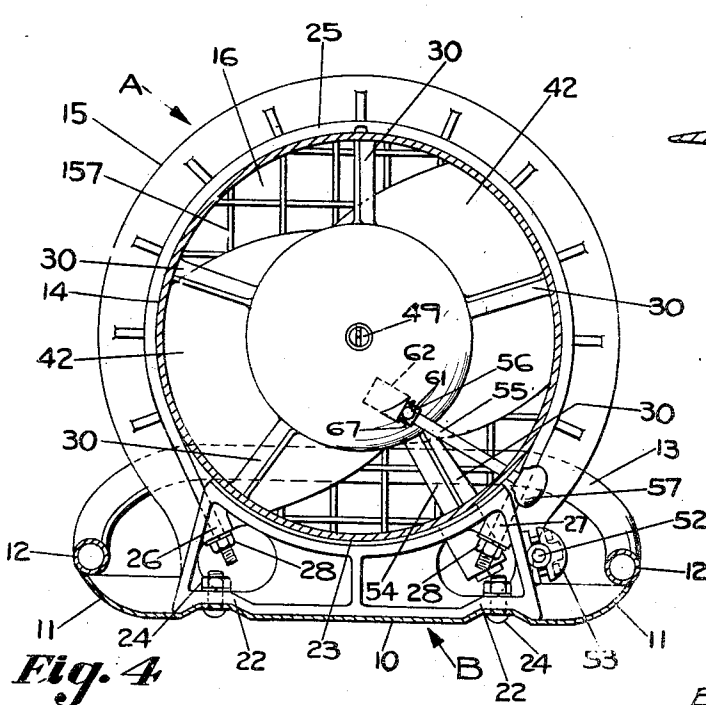
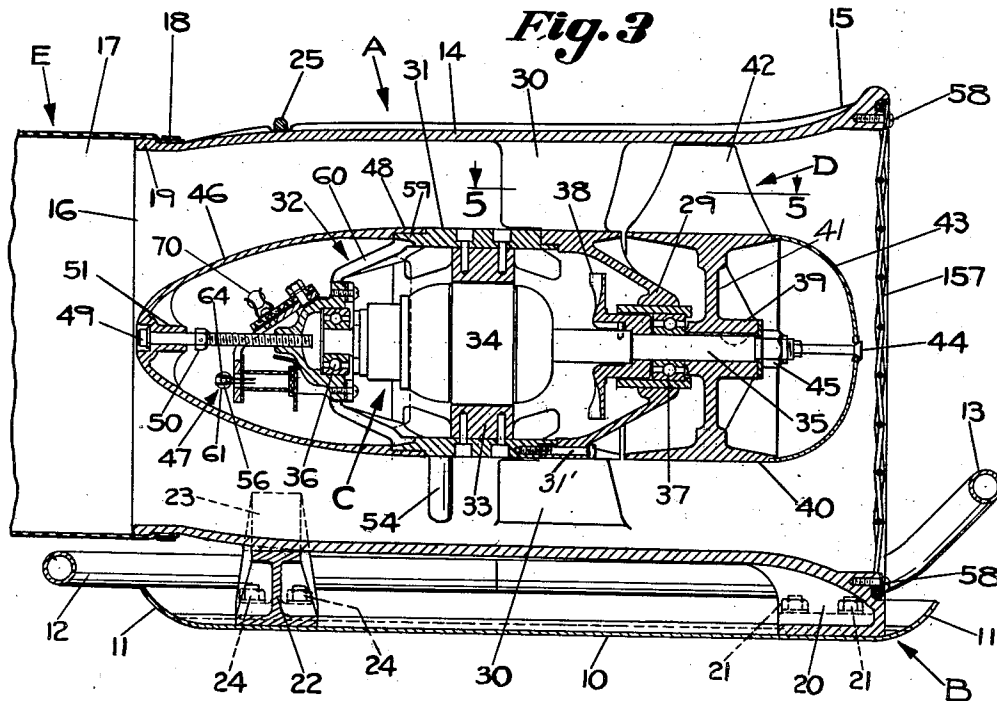
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UNITED STATES PATENT OFFICE

2,323,456

VENTILATOR

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Application July 12, 1940, Serial No. 345,186

10 Claims. (Cl. 230—117)

This invention relates to a new and improved ventilator or blower for use in underground mines to supply clean air at the working faces that are usually dead ends.

One object of the invention is to provide in a device of this class a compact light weight unit that can be readily moved from place to place.

Another object of the invention is to mount the device for supplying power inside the housing with its power shaft coaxial with the centerline or longitudinal axis of the housing.

Another object of the invention is to cast a portion of the motor frame integral with the housing utilizing air straightening vanes as a means of connection leaving openings for air flow spaced circumferentially about the motor.

Other objects of the invention will appear hereinafter the novel features and combinations being set forth in the appended claims.

In the drawings:

Fig. 1 is a side elevation of the ventilator or blower.

Fig. 2 is an end elevation of the device shown in Fig. 1 looking into the inlet of the ventilator.

Fig. 3 is a longitudinal sectional view.

Fig. 4 is a sectional view looking in the direction of the arrows 4—4, Fig. 1.

Fig. 5 is a cross section of one of the air straightening vanes and one blade of the impeller.

Fig. 6 is an enlarged view of the electric switch and associated parts.

The ventilator or blower herein disclosed and claimed may be utilized in many places where a flow of air is to be produced but for purpose of clarity it will be described as a blower to which a flexible tube or conduit is attached for the purpose of carrying air to a mine working place.

In the various systems of mining employed, there is a network of haulage ways, entries, air courses and rooms, all portions of which should be well ventilated. The actual working places are commonly rooms, driven off the entries, which advance leaving side walls or pillars for protection against the roof falling. It is difficult to change the air in these dead end working places unless a blower or ventilator is placed in the entry, where the air is being constantly changed by a main ventilating fan, and extend a flexible air duct or readily extensible tubing to a point in close proximity to the face. The blower takes clean air from the entry and blows it to the face which by way of displacement causes the foul air at the face to flow out through

the room neck into the entry where it is diluted by mixing with the clean air.

A mine has many such working places only a relatively few of which are in use at any one time. It would be costly to provide each with an individual ventilator; therefore any unit put to such use must be compact and of light weight so that it can be quickly and easily moved.

Referring to the drawings, the ventilator or blower comprises a housing A mounted upon a base B which may be picked up and carried or slid over the mine floor. Inside the housing A there is mounted a motor C to which is operatively connected the fan wheel or impeller D. A flexible tubing E may be laid to carry the flow of air produced by the ventilator to any desired location.

The base B comprises a plate 10 substantially flat on the bottom with curved portions 11 around the entire outer edge so that it may be moved by sliding. To the edges of the curved portions 11 are fixed as by welding a rectangular shaped pipe frame 12 having a raised portion 13 for a handle.

The housing A comprises a substantially cylindrical body 14 with an outwardly flared inlet opening 15 and a slightly reduced outlet opening 16 to which may be attached the flexible tubing 17 by means of a clamping ring 18. The rim 19 of the outlet 16 prevents slippage of the ring 18 and the tubing 17 should the tubing be pulled or the ventilator be moved. The housing A is provided with a pair of cast feet 20 at the inlet end which rest upon the base plate 10 and fixed thereto by the bolts 21. A saddle 22 having a top shaped to fit the outside of the housing as indicated at 23 is fixed to the opposite end of the base plate 10 as by means of the bolts 24. The outlet end of the housing 14 rests in the curved portion 23 of the saddle 22 and is clamped in a fixed position by means of a circular bar 25 which encircles the housing and extends through apertures in the lugs 26, 27 of the saddle 22. Nuts 28 are placed on the screw thread ends of the bar 25 to maintain this fixed relation.

The motor C comprises a main frame including a cylindrical body portion or section having an end bell 29 which, as shown in Fig. 3, is cast integral with the circumferentially spaced radial vanes 30 which in turn are cast integral with the housing A. The housing A, vanes 30 and the motor main frame section having end bell 29 all integral with each other, are preferably made of an alloy comprising principally aluminum. The

fixed and stationary supporting vanes 30 are preferably airfoil shaped in cross-section as shown in Fig. 5.

While in Fig. 4 five of such vanes 30 are shown, the number may be varied. The vanes 30 should be sufficient in number, however, to support the motor and rotary elements including the impeller D and nevertheless leave sufficient space therebetween to permit free flow of air through the portable unit shown in Fig. 3.

The field frame 31 of the main frame of motor C is made of magnetic material such as cast steel, in order to have requisite strength and to create the proper magnetic field. As here shown the field frame 31 is generally cylindrical and has cast integral therewith another end bell 32 which may provide a complete enclosure of the rotating elements of the motor when said field frame 31 is attached to the end bell 29 which has been previously described as being cast integral with the vanes 30 and the housing 14. The field frame 31 may be secured rigidly to the end bell 29 by means of a plurality of circumferentially spaced screws one of which is shown at 31' in Fig. 3. The end bell 32 may, however, be a separate casting of aluminum alloy in the form of an open frame, fixed to the field frame 31 in the same manner as the end bell 29 is fixed thereto. It is thus seen that the motor main frame is formed of two separable sections each including a cylindrical portion and an end bell.

Attached to the inside of the outer walls of the field frame 31 is a series of field pole pieces 33. The rotor or armature 34 is mounted upon an armature shaft 35 which is journaled in the ball bearings 36, 37, the ball bearing 36 being carried by the end bell 32 and the ball bearing 37 being carried by the end bell 29.

The impeller D comprises a hub 39, keyed to the portion of the armature shaft 35 that extends beyond the end bell 29, a circular flange 40 being connected to the hub 39 by a web 41. On the outer periphery of the flange 40 are two relatively wide, short, impeller blades 42. In order to obtain substantially frictionless flow of air into the housing A there is provided a sheet metal blunt nose cowl 43 fitted to the outer periphery of the flange 40 of the impeller wheel and held in position by a relatively long screw 44 one end of which is adapted to fit a screw threaded aperture in the end of the armature shaft 35, a lock nut 45 preventing accidental displacement.

Rotation of the impeller 42 creates movement of the air in a spiral path and it must be changed to a straight line flow to develop a high efficiency. The airfoil shaped arms 30 being designed to straighten the flow of air with a minimum frictional loss, their size, shape and position with respect to the impeller 42 are important. When the impeller blade 42 rotates in the direction of the arrow 68 in Fig. 5, the fixed and stationary blades 30 are engaged by the spirally propelled air to straighten the air flow to the direction indicated by the arrow 69.

The streamlined tail piece 46 is shaped to also reduce friction loss. It covers the rear end of the motor C and houses the electrical switch 47. A ring 48 of the tail piece 46 fits tightly over a complementary flange 59 of the field frame 31 and is held in fixed relation thereto by a bolt or screw 49 which engages a screw threaded aperture in the end bell 32.

A rotary fan 38 is fixed to the armature shaft 35 inside the bell 29. The end bell 32 is provided with a series of circumferentially spaced openings

indicated at 60 which permit a flow of air produced by the rotary fan 38 to pass through the motor C and over the switch 47. Constant circulation of the air within the motor housing prevents undue heating of the various electrical elements.

Power for operation of the motor C is supplied through an electric cable 52 one end of which may be attached to any source of power and the other end brought through a cable clamp 53 on the saddle 22 and into a tubing 54 which extends through the housing 14 and into the field frame 31. An "off" and "on" switch 47 housed within the tail piece 46 is connected in the motor circuit and may be operated by means of the lever 55 which extends through the housing 14 and connects with the switch handle 61 as indicated at 56. Pulling on the knob 57 throws the switch 47 to the "on" position to energize the motor, and movement in the opposite direction throws it "off."

It will be noted that the push and pull actuating device for operating the switch 47 is slidably journaled in a bearing 62 cast integral with the tail piece 46. One end of the device 61 is necked down as indicated at 63 and engages a U-shaped yoke 64 of the switch. Movement of the device 61 rotates the switch 47 about a pivot point 65 to engage or disengage the contactors 66.

The tail piece 46 may be removed by rotation of the screw 49 in a direction to remove said screw from the screw threaded aperture in the end bell 32; when the nut 50 which is pinned to the screw 49, engages the boss 51 in the end of the tail piece 46, continued rotation of the screw 49 pulls the ring 48 away from the complementary part 59 on the field frame; in other words, it acts as a screw jack for removal of the enclosing tail piece 46 from the field frame 31. The boss 51 and the nut 50 constitute abutment mechanism between the screw 49 and the enclosure 46 to withdraw the latter from the motor C by rotating the screw to retract such enclosure. The nut 50 serves as a retainer in that it retains the screw 49 connected to the enclosure 46 for limited movement relatively thereto. When the screw 49 is turned in a direction to tend to retract the same from the bearing support 60 the retainer 50 will engage the abutment 51 to force the enclosure 46 away from and off the motor. The screw 49 can be operated from without the enclosure 46 to hold the latter tightly against the motor frame when desired. Removal of the cotter pin 67 separates the lever 55 from the switch actuating device 61 and permits removal of the device 61 together with the tail piece 46. Access may then be had to the motor brushes and switch 47; also to fuse 70 for renewal of same.

Since the ventilator or blower may be used in places where particles sufficiently large to cause bending or breakage of parts may be pulled into the inlet opening there is provided a screen 157 attached to the inlet end of the housing 14 by means of bolts 58.

Obviously those skilled in the art may make various changes and modifications in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and we wish therefore not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodi-

ment of our invention what we desire to secure by Letters Patent of the United States is:

1. In a ventilator, the combination with a one piece cylindrical housing, of a motor having a sectional main frame and a rotor mounted on a shaft, an air impeller on the rotor shaft to rotate therewith, and a plurality of spaced-apart vanes all integral with said one piece housing and all integral with one of the sections of said motor main frame whereby said housing, vanes and motor main frame section are in one integral piece, one section of said motor frame being of magnetic material to form the field frame of the motor.

2. In a ventilator, the combination with a one piece cylindrical cast metal housing, of a motor comprising a cylindrical sectional frame and a rotor mounted on a shaft, an air impeller on the shaft of the motor, and radial air vanes connected at opposite ends directly to said housing and to one of the sections of said frame, said last-named frame section being cast integral with said vanes and said housing whereby said housing, vanes and frame section comprise a single casting, and both frame sections being of the same diameter arranged end to end, and means attaching said frame sections together whereby one of said sections is supported by the other.

3. In a ventilator, the combination with a one piece cast cylindrical housing, of a motor comprising a sectional main frame, said motor also comprising a rotor on a shaft, spaced bearings for said shaft, one carried by each of the sections of said frame, one section constituting the field frame of the motor, means attaching it to be carried by the other section with the outer surfaces of the sections flush in the direction of the air current through the housing, an air impeller carried by said shaft, and combined motor supporting and air guide vanes cast integral with said housing and the said other section, whereby said housing, guide vanes and other motor section are formed as one integral casting.

4. In a ventilator, the combination with an outer housing through which an air current is adapted to flow, of a motor positioned within and extending along the axis of said housing and having a sectional main frame and a rotor mounted on a shaft, each section of the main frame including an integral cylindrical portion and an end bell having a bearing for the adjacent portion of said shaft and one section being of magnetic material to form the field frame of the motor, an air impeller on the rotor shaft and within said housing, a plurality of spaced-apart air guide vanes extending between the housing and one of the sections of the motor main frame and supporting the motor with the axis of its shaft coincident with the axis of said housing, each of said guide vanes being

formed integral with the cylindrical portion of one of the sections of the motor frame at its inner end and secured rigidly to said housing at its outer end.

5. In a ventilator, the combination with a housing for airflow therethrough, of a rotary motor within said housing and circumscribed thereby, said motor having a sectional main frame with an integral end bell on each section carrying a bearing for the rotor shaft of the motor, an air impeller on said rotor shaft and within said housing, and mechanism integral with said housing and with one of the motor frame sections for supporting the motor spaced on all sides from said housing.

6. In a ventilator, the combination with a housing for airflow therethrough, of a motor within said housing and circumscribed thereby, said motor having a sectional frame, each section having an integral end bell with a bearing for a shaft carrying a rotor in the frame, an air impeller on said shaft within said motor frame, and a plurality of radial air vanes cast integrally with the housing and with one of said frame sections of the motor frame to support the motor with the axis of rotation of said shaft coincident with the axis of said housing, said housing, air vanes and one frame section comprising a single casting.

7. As an article of manufacture, a one piece member formed as a single casting comprising a complete ventilator housing, a plurality of air guide vanes, and at least part of a motor main frame, with the air guide vanes adapted to support said motor frame part from said housing.

8. As an article of manufacture, a one piece member comprising at least part of a ventilator motor main frame, spaced-apart air guide vanes extending outwardly from said motor frame part, and a housing at the outer ends of the said vanes and circumscribing the motor part, said air guide vanes being integral with said housing and said motor part to form said one piece member.

9. As an article of manufacture, a single casting including as integral parts thereof a complete ventilator housing, radially extending air guide and motor supporting vanes and a part of an electric motor including a circular motor main frame part and an end bell adapted to receive and support a bearing of a motor shaft.

10. As an article of manufacture, a single casting including as integral parts thereof a section of an electric motor main frame including a circular portion having an end bell adapted to receive and support a motor bearing, and radially extending air guide vanes adapted to have their ends attached to an enclosing housing.

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