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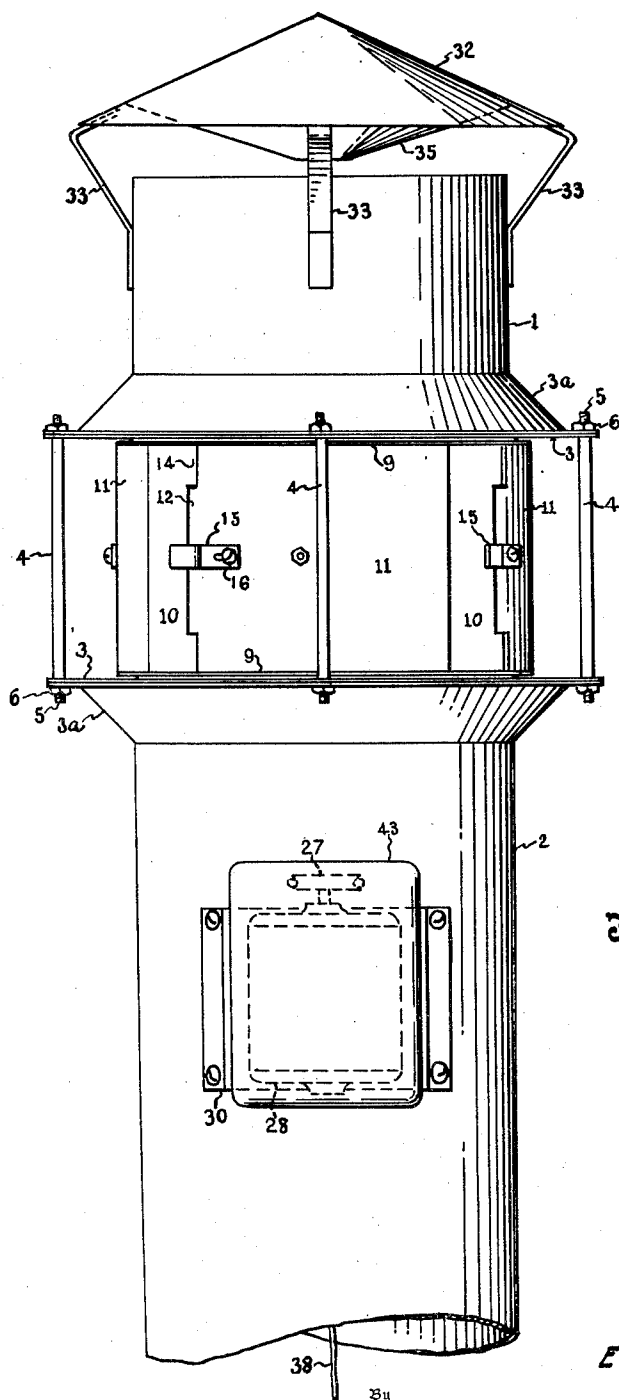
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2,383,003

FORCED VENTILATION APPARATUS

Filed May 27, 1943

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

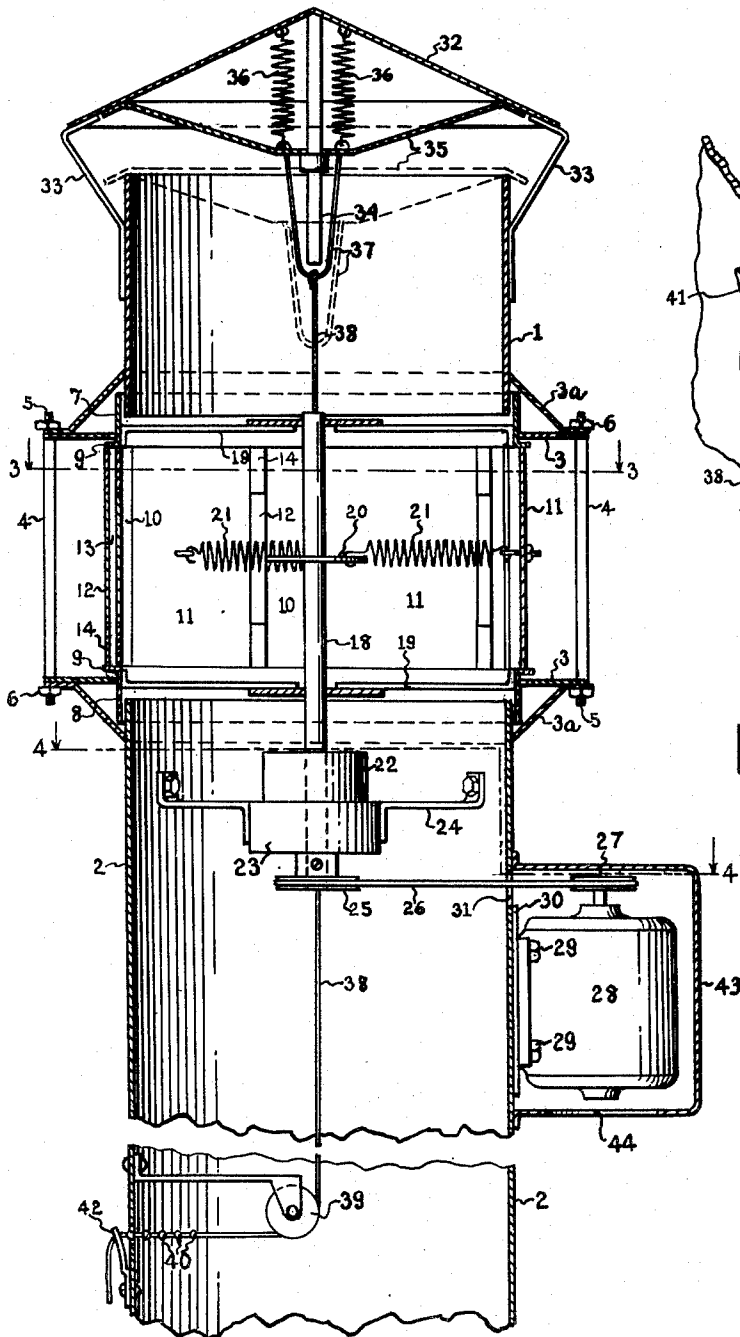


Fig. 2.

Fig. 5.

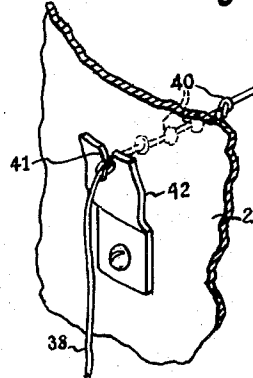
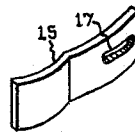


Fig. 6.



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Fig. 3.

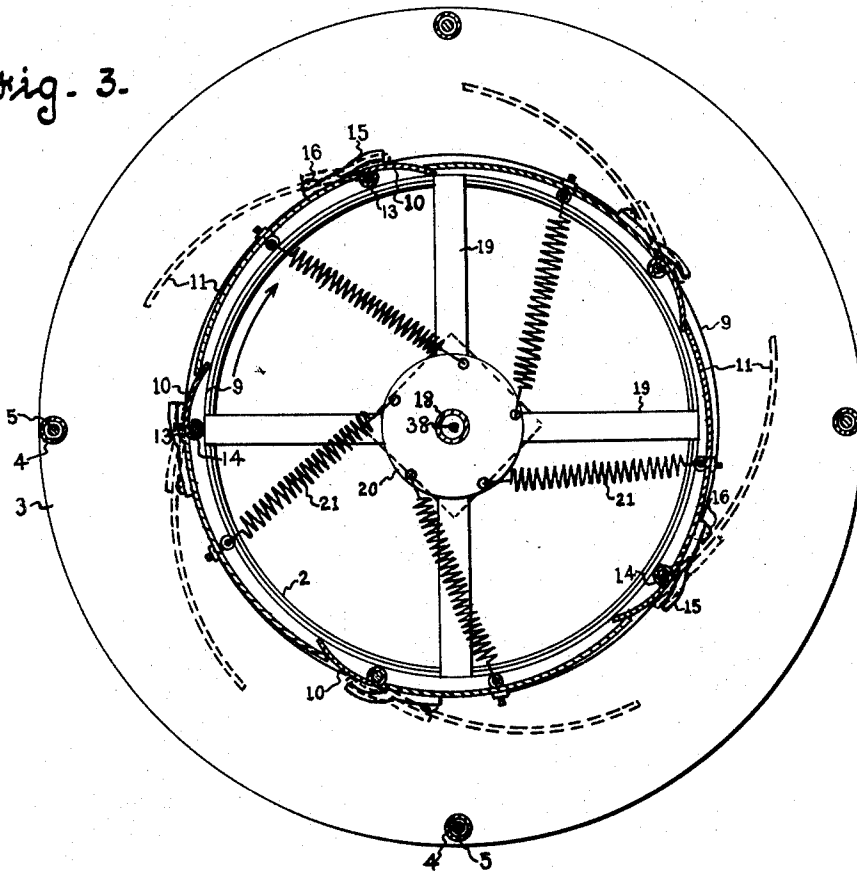
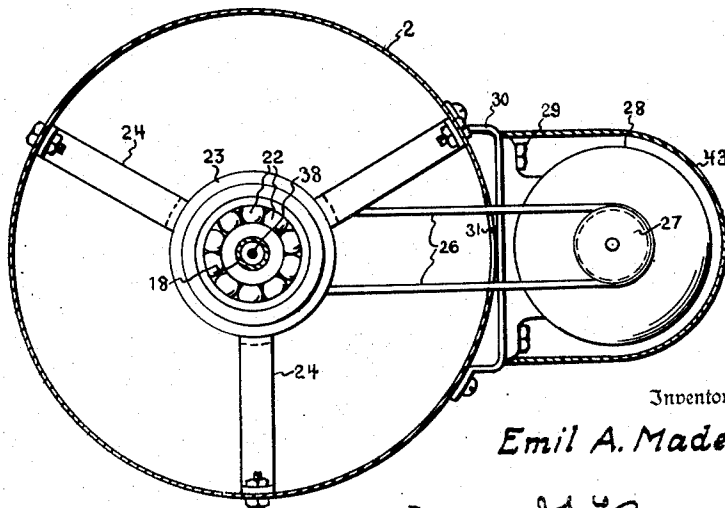


Fig. 4.



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UNITED STATES PATENT OFFICE

2,383,003

FORCED VENTILATION APPARATUS

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12 Claims. (Cl. 230-114)

This invention relates to forced ventilation apparatus and particularly apparatus establishing a ventilating flow through a duct by a blower installed at or near the discharge end of the duct.

An object of the invention is to regulate the volume of fluid discharge from a duct responsive to a blower installed at or near one end of the duct by providing the blower with opposed inlets and a peripheral outlet, and utilizing one of such inlets to withdraw fluid from the duct, while selectively regulating fluid admission to the other inlet.

Another object is to provide an improved type of blower comprising a cylindrical rotary carrier having openings for fluid flow and blades hinged to said carrier serving to close such openings when the carrier is idle and adapted to centrifugally swing outward to an impelling position when the carrier is driven.

Another object is to provide improved damper means for regulably closing an end of a ventilating duct.

These and various other objects are attained by the construction hereinafter described and illustrated in the accompanying drawings, wherein:

Fig. 1 is a side elevational view of the improved apparatus.

Fig. 2 is an axial vertical sectional view taken on the line 2-2 of Fig. 1.

Fig. 3 is a cross section on the line 3-3 of Fig. 2, particularly showing the blower construction.

Fig. 4 is a cross section on the line 4-4 of Fig. 2, primarily showing the mounting for the blower shaft.

Fig. 5 is a perspective view showing a provision for engaging and retaining a damper control cord.

Fig. 6 is a perspective view of a stop member carried by each blower blade.

In these views, the reference characters 1 and 2 designate spaced upper and lower sections of a sheet metal duct particularly suited for ventilating use, but suited to conduct air or some other gas for any purpose. The spaced ends of said sections rigidly carry parallel sheet metal collars 3 preferably transverse to the duct 1, 2, their inner diameter approximating that of the duct and their outer diameter being considerably greater. The desired spaced relation of the sections 1 and 2 is maintained by a plurality of sleeves 4, formed preferably of standard pipe, interposed between the collars 3, the latter being clamped against the sleeve ends by bolts 5 extending through the sleeves and outer margins of said collars and by nuts 6 tensioning said

bolts. It is preferred to attach said collars to the duct sections by welding or otherwise tightly securing their outer margins to those of reversely coned collars 3a, which fixedly embrace the sections 1 and 2 a short distance from the spaced ends of said sections. This affords a strong mounting for the connections formed by the sleeves 4 and bolts 5 and also establishes an efficient seal, as hereinafter more fully explained.

Between said duct sections is disposed a blower of novel construction, rotative in its entirety about the axis of said sections and equipped with centrifugally movable blades. This blower comprises a hollow substantially cylindrical blade carrier having upper and lower sheet metal rings 7 and 8 overlapping the spaced ends of the sections 1 and 2 with a running clearance therefrom, the relatively adjacent ends of said rings having outwardly projecting annular flanges 9 projecting between the collars 3 with a running clearance from the latter. Rigidly interconnecting the rings 7 and 8 are sheet metal strips 10, spaced to form openings for air discharge from the duct 1, 2. Similarly hinged to the strips 10 are arcuately curved blower blades 11 serving to either impel air outwardly through said openings or close the latter, according as said blades are outwardly swung as shown in dash lines in Fig. 3 or seated against the strips 10, forming a cylinder with the latter. The blades marginally carry hinge barrels 12 engaging hinge pin 13 retained in barrels 14 respectively formed on one lateral margin of each strip 10. Confinement of said pins between the upper and lower flanges 9 assures retention of the pins in their barrels. Outward swinging of the blades is limited by stops 15 exteriorly mounted on the blades by bolts and nuts 16, said stops projecting across and beyond the hinges and being terminally engageable with the strips 10 to limit outward blade travel. The openings 17 of said stops for the bolts 16 are slightly elongated transversely to the blade hinges, affording a regulation of the extent to which the stops tangentially project from the blades and a selection of the outer limiting position of the blades.

The blower comprises a tubular shaft 18 disposed at the axis of the duct 1, 2, and is fixedly mounted on the shaft by two spiders 19 rigidly engaging the rings 7 and 8. A disk 20 fixed on the shaft anchors a plurality of coiled springs 21 individually extending to the blades and resisting swinging thereof from their closure positions. The shaft extends downwardly from the blower to engage an anti-friction bearing 22 installed in

a support 23 mounted centrally in the duct section 2 by spider arms 24. Said anti-friction bearing is of a well known type suited to both support and journal the shaft 18 in its upright position, eliminating necessity for any additional bearing.

The shaft projects below the support 23 to mount a pulley 25 driven through a suitable belt 26 from the pulley 27 of an electric motor 28 disposed exteriorly of the duct section 2 and bolted as indicated at 29 to a mounting plate 30 carried by such section, the latter being provided with a slot 31 through which the belt extends.

The upper duct section has a conical cap 32 fixedly spaced by arms 33 above the open upper end of said section, the cap diameter exceeding that of the duct to effectively exclude rain and snow. Centrally and rigidly secured to said cap is a downwardly extending guide rod 34, slidably mounting a damper 35 of inverted conical form, and disposed between and interconnecting the cap and damper is a pair of coiled springs 36 urging the damper to a seat against the cap. A wire yoke 37 of an elongated U-shape is attached to the damper at opposite sides of the guide rod with its lower end below the rod for engagement by a cord 38 or other element, preferably flexible, which passes downwardly through the hollow shaft and duct section 2 to any desired control level. At such level, the cord is guided by a roller 39 around which it extends exteriorly of the duct. Any suitable provision is made for securing the cord at different points of its length, the cord, as illustrated being knotted at short intervals as indicated at 40, to engage a notch 41 of a bracket 42 mounted on the duct.

In use of the described apparatus, when forced ventilation is desired, the motor 28 is energized and the blower driven, its direction of rotation being indicated by the arrow in Fig. 3. The blades 11 then centrifugally assume their outer limiting position and maintain a discharge of air between the strips 10. To derive a maximum ventilating effect from the blower the damper 35 is shifted by its control cord 38 to its lowermost position, seating it on and fully closing the upper end of the upper duct section and assuring that all air discharged by the blower will be drawn from the lower duct section. If it is preferred to only partially utilize the ventilating effort of the blower, the damper 35 is adjusted in an intermediate position, so that the discharged air includes a selected volume admitted to the upper duct section. Thus in a quite simple manner, the degree of forced ventilation may be regulated throughout a wide range.

When such ventilation as is needed is obtainable by natural draft in the duct, the blower is not used, the damper being usually adjusted to its fully raised position affording a maximum discharge capacity at the top of the duct. However, the damper may serve for regulation of natural draft in the same manner as for forced draft.

It is to be observed that the construction permits the duct to be completely shut off from outer atmosphere, as when it is desired to maintain a considerable temperature differential between such atmosphere and a space to be ventilated.

The described type of blower is particularly suited to its ventilating use in the disclosed apparatus, since automatic shifting of the blades to their closure-forming position positively assures the blower outlets being completely closed when the blower is idle, and thus prohibits entry of rain, snow, or dust through such outlets while

assuring against heat loss or gain by a convection air flow through said outlets. Where manual controls must be operated on discontinuance of a forced ventilation, exercise of such controls may be overlooked, and moreover their provision is likely to make the installation more complex and costly than that now disclosed.

It will be noted that in a natural draft use of the described apparatus, both sections of the duct serve for a ventilating discharge of air, whereas the upper section functions to regulate the ventilating flow through the lower one, when the blower is operating.

By locating the springs 36 between the reversely coned cap 32 and damper 35, these springs are largely enclosed and hence protected from moisture and consequent rust.

The collars 3 and 3a in conjunction with the duct form annular dead air spaces through which must pass any air leaking into or out of the duct between its sections and the blower. A double seal against such leakage is established at each such dead air space, due to overlapping of the duct ends by the rings 7 and 8 and overlapping of the collars 3 by the flanges 9.

To protect the motor 28 from the weather and also to subject same to a cooling air flow, it is preferred to provide a sheet metal housing 43 for said motor, such housing having an air inlet 44 at its bottom. Thus air drawn in through said inlet will be delivered to the duct through the slot 31 keeping the motor from overheating when driving the blower.

What I claim is:

1. A blower comprising a shaft, a pair of rings coaxial with and spaced lengthwise of said shaft, means for mounting the rings coaxially on the shaft, members interconnecting the rings and forming a plurality of openings between the rings, closures for said openings pivoted on said interconnecting members and adapted to swing outwardly about their pivots to act as air impellers, the mass of said closures occupying a relation to their pivot axes affording a centrifugal outward actuation of the closures, means yieldably resisting outward actuation of the closures, and means for predeterminedly limiting outward actuation of the closures.

2. A blower comprising a plurality of blades, a substantially cylindrical hollow rotary carrier for the blades formed with circumferentially spaced openings proportioned to be closed by the blades, means hinging the blades substantially at corresponding margins thereof to the carrier substantially at corresponding margins of said openings, whereby the blades may centrifugally swing outwardly from their closure positions, the hinge axes being substantially parallel to the carrier axis, means yieldably urging the blades to their closure-forming position, and means reacting between the blades and carrier to limit outward swinging of the blades, the carrier comprising a pair of annular flanges outwardly projecting from the carrier and substantially transverse to the blower axis, the blades swinging between and in proximity to said flanges.

3. A blower comprising a plurality of blades, a substantially cylindrical hollow rotary carrier for the blades having two spaced exterior annular flanges transverse to the carrier axis, and formed between said flanges with circumferentially spaced openings proportioned to be closed by the blades, pins hinging the blades substantially at corresponding margins thereof to the carrier substantially at corresponding margins of said openings,

whereby the blades may centrifugally swing outward from their closure-forming position, said pins being restrained by said flanges from endwise shifting, and means yieldably urging the blades to their closure-forming position.

4. A forced ventilation apparatus comprising a duct having two spaced coaxial sections, a blower installed between said sections and rotative about the axis of said sections and having a plurality of blades adapted to project outwardly beyond said sections for withdrawing a fluid from at least one of said sections, a pair of collars respectively carried by the respective sections and disposed exteriorly of the sections in proximity to the blades, the blades being disposed between said collars as the blower rotates, and means rigidly interconnecting said collars to maintain the spaced relation of said sections.

5. A ventilating apparatus as set forth in claim 4, said blower comprising a substantially cylindrical hollow carrier for said blades having openings to the space between said collars, and means hinging said blades on the carrier to swing between the collars from a closure position for said openings to a position for inducing a fluid flow through the openings.

6. In a forced ventilation apparatus, the combination with a duct having two spaced substantially coaxial sections, of a blower installed between said sections and comprising a hollow substantially cylindrical carrier rotative about the axis of said sections and having openings for the outward discharge of a fluid drawn from at least one of said sections and having blades for inducing such discharge, the ends of said carrier lapping and having a running clearance from the ends of said duct, a pair of collars between which the blades are disposed, said collars surrounding the carrier and having a running clearance therefrom, and annular supports for said collars fixed on the duct sections and diverging from the said sections in approaching the collars.

7. In a forced ventilation apparatus, the combination with a duct having spaced, substantially coaxial sections, one for a ventilating flow and the other to control such flow, the control section being open at its end remote from the ventilating flow section, a cap spaced from said open end along the extended axis of said duct, a damper movable between said open end and the cap to regulate air admission to the control section, means for establishing selective positions of said damper, and a blower installed between said sections and adapted to withdraw air from the ventilating section in a volume regulated by air admission to the control section.

8. In a ventilating apparatus, the combination with an upright duct having an open end, a cap spaced above said end, and means rigidly supporting the cap from the duct, of a damper of inverted conical shape disposed between said cap and duct, spring means installed between said cap and damper urging the damper to a seat on the cap, such spring means being fully enclosed by the cap and damper when the damper is free to respond thereto, means for guiding the damper in travel to and from a seat on said open end and

a control element for the damper downwardly extending through the duct.

9. A blower comprising a rotary carrier having openings for fluid flow, elements between said openings, and a plurality of blades hinged to the carrier to swing outwardly from a closure-forming position with respect to said openings to a position inducing fluid flow through the openings, the mass of the blades occupying a relation to their hinge axes to afford a centrifugal actuation of the blades to their flow-inducing position, means yieldably urging the blades to their closure position, stops respectively mounted on the respective blades and independently adjustable to selectively limit outward swinging of the blades by engagement with said elements between the openings, and means for holding said stops definitely adjusted.

10. A blower comprising a rotary carrier having openings for fluid flow, a plurality of blades hinged substantially at corresponding margins thereof to the carrier to swing outwardly from a closure-forming position with respect to said openings to a position inducing fluid flow through the openings, the mass of the blades occupying a relation to their hinge axes to afford a centrifugal actuation of the blades to their flow-inducing position, means yieldably urging the blades to their closure position, and stops respectively carried by the respective blades and projecting across their hinge axes to swing inwardly as the blades swing outwardly to thereby engage the carrier and limit outward swinging of the blades.

11. In a forced ventilation apparatus, the combination with a duct having two spaced substantially coaxial sections, of a blower installed between said sections and comprising a hollow substantially cylindrical carrier rotative about the axis of said sections and having openings for the outward discharge of a fluid drawn from at least one of said sections and having blades for inducing such discharge, the ends of said carrier lapping and having a running clearance from the ends of said duct, a pair of collars between which the blades are disposed, said collars surrounding the carrier and having a running clearance therefrom, and annular supports for said collars fixed on the duct sections, said collars and supports being correlated with the ends of the carrier to form annular dead air spaces for sealing purposes.

12. A forced ventilation apparatus comprising a duct having two spaced coaxial sections, a blower installed between and rotative about the axis of said sections and having a plurality of blades adapted to project outwardly beyond said sections for withdrawing a fluid from at least one of the sections, a pair of collars exteriorly projecting from the sections and confining air between the blades, the blower having rings lapping the spaced ends of the sections with a running clearance from such ends, and a plurality of spaced substantially rigid connections between said collars, whereby one of said sections is carried by the other.

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