Jan. 6, 1931. E. L. ANDERSON 1,787,654

APPARATUS AND METHOD OF CONTROLLING FANS

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Fig. 1.

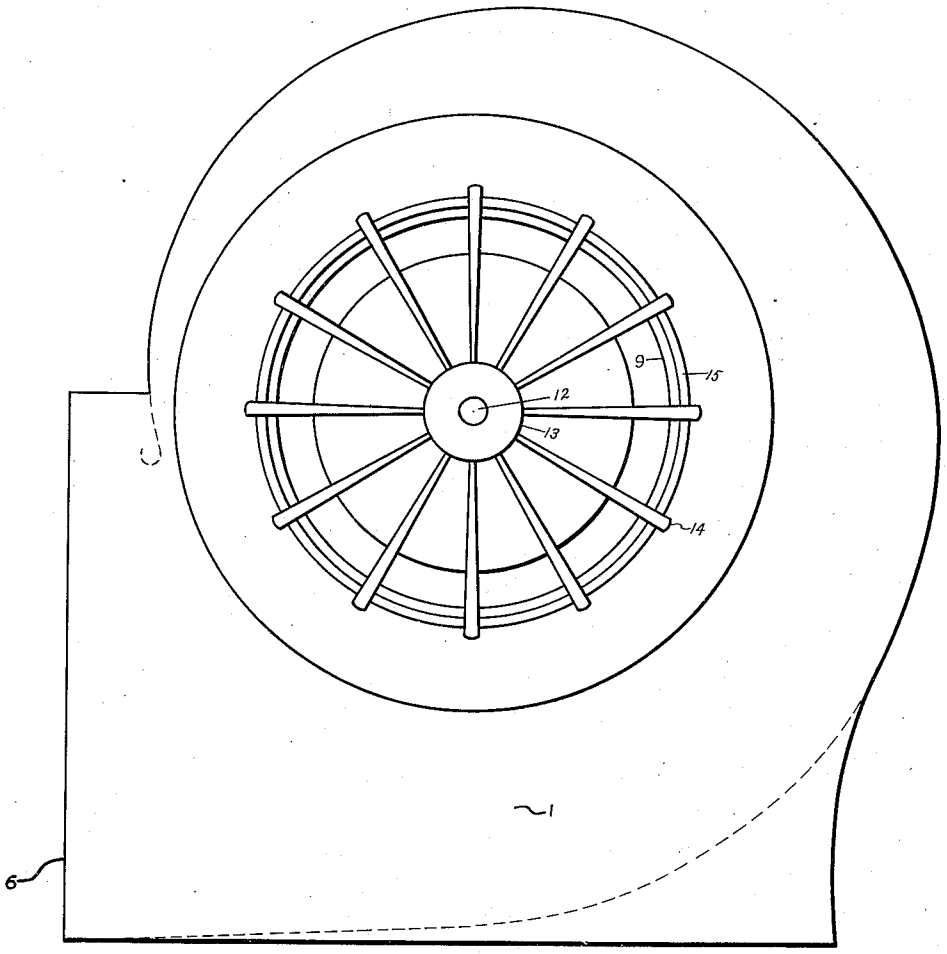
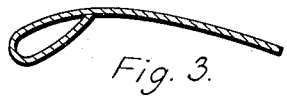


Fig. 3.



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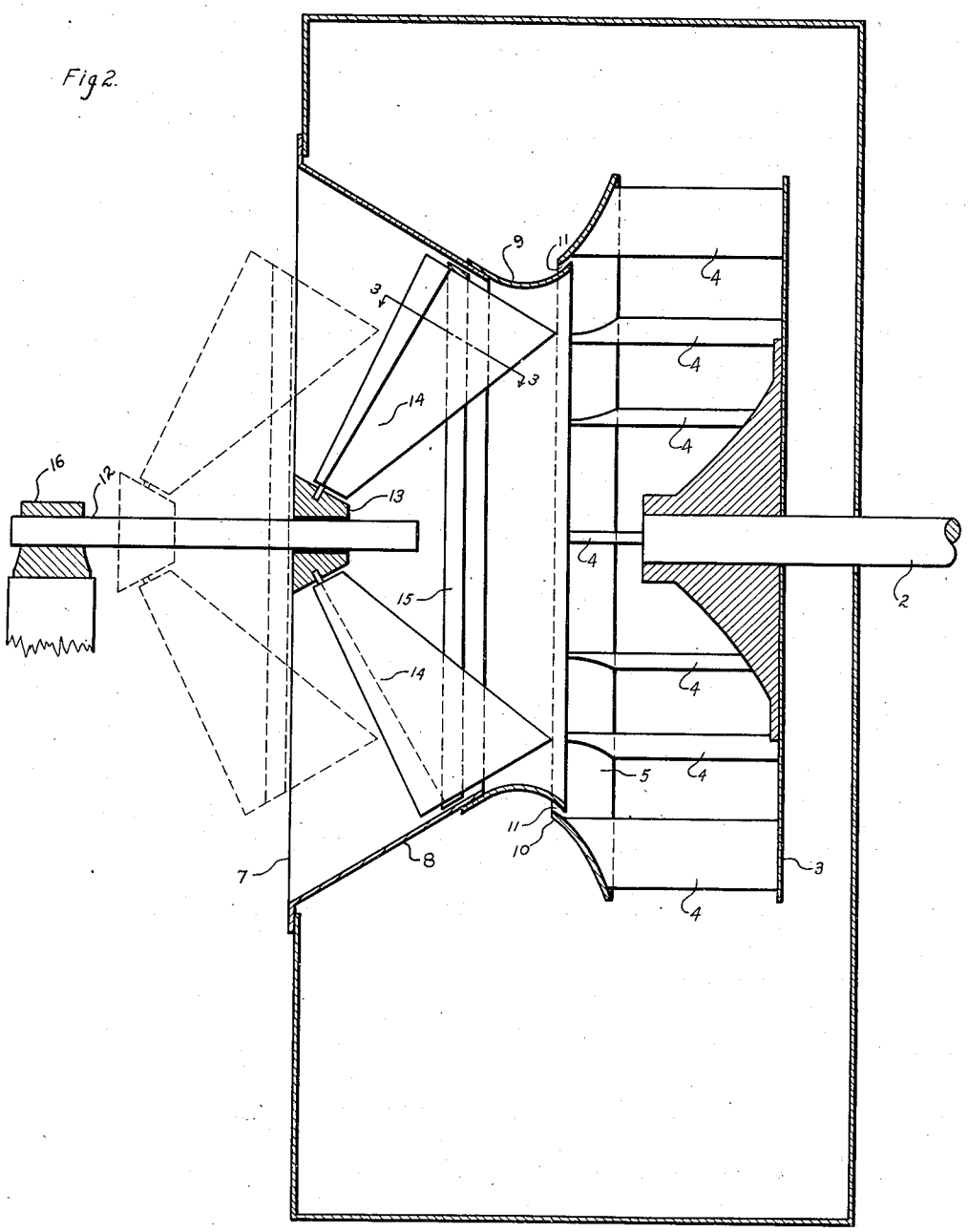
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Fig 2.



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UNITED STATES PATENT OFFICE

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APPARATUS AND METHOD OF CONTROLLING FANS

Application filed May 18, 1929. Serial No. 364,289.

This invention relates to fans that have a scroll housing and a rotating fan within the housing.

It is an object of this invention to control the static pressure and volume of a fan when operating at constant speed.

It is a further object to effect this control by imparting to the air entering the fan rotary motion in direction of the wheel rotation in such a way that the pressure and volume of air, when the fan is operating at constant speed is regulated according to the position of the control apparatus with respect to the inlet of the fan.

It is a further object to provide a plurality of vanes set at an angle from approximately twenty to sixty degrees to the fan shaft located in the air inlet and to provide means for adjusting such blades as a unit at different positions within the inlet to control the air flow.

It is an object of this invention to provide a fan funnel shape adapted to conduct the air directly into the body of the fan, with means in said passageway for controlling the admission of air through the passageway into the fan.

It is also an object of this invention to provide co-operating means associated with the fan overlapping the inner ends of the inlet passageway to effect a more direct and efficient expulsion of the air from the fan casing, and to avoid obstructing eddies and cross currents.

It is a further object of this invention to provide an adjustable means within the inlet passageway for controlling the admission of air. This means in the present instance is shown to be a series of vanes radially extending from a central support and adapted to be inserted into or partly withdrawn from the passageways so that the passing of the air through the passageway can be controlled.

It is a further object of this invention to provide a passageway having its inner end curved so that the air as it enters the fan is well distributed through the fan surface, and is partly directed before entering the fan to its course to be acquired due to the operation of the fan.

Referring to the drawings:

Figure 1 is a side view of the fan and fan casing, showing the entrance passageway.

Figure 2 is a vertical section of the fan and casing on the line of the fan axis.

Figure 3 is a section through one of the vanes.

The numeral 1 is used to designate the housing, which is scroll shaped and has on one face or side thereof an opening for the admission of air. Through the other side there is an opening for the admission of the shaft, indicated by the reference character 2.

The purpose of this shaft is to support and rotate a fan wheel 3. This fan wheel is located in one side of the housing, as clearly shown in Figure 2. On the outer periphery of the fan wheel there is located a series of substantially radially arranged blades 4. These blades may be radially arranged or they may be slightly varied to more efficiently direct the current of air and force the air through the housing.

The ends of the blades remote from that part of the wheel which carries the shaft are partly cut away to adapt them to receive and carry an annular shroud member 5. This shroud member is attached to the blades and rotates with the blades during the operation of the fan for the purpose of preventing cross currents and eddies that impede the flow of the air from the fan in a fan structure of this kind.

The outlet of the fan housing is indicated by the numeral 6, while the inlet passageway is indicated by the numeral 7 and is circular in shape adapted to receive and carry on the adjacent part of the housing a funnel shaped casing 8, forming a passageway for the air from the outside of the housing into the housing and in contact with the fan. The inner end of this funnel shaped casing is flared, as indicated by the numeral 9.

The shroud member extends inwardly and outwardly from the outer periphery of the fan in a curved line, as shown by Figure 2, so that the more restricted part 10 of the shroud member overlaps the inner flared end of the

funnel shaped casing, which provides the entrance passageway. The shroud overlaps said end in such a way as to form between the two an annular space 11. The purpose of this space is to permit a recirculation of the air back into the fan in such a way as to effect an injector action and aid in the passage of the air from the fan through the outlet.

It has been found in fans of this kind that part of the outgoing air from the fan blades will pass off to one side and reenter the blades at right angles to the current in the blades, whereby the blade is retarded and eddies and cross currents are set up, but by means of this shroud the returning air is forced to enter the air in the fan in such a direction that the velocity of the air leaving the fan is not impeded but rather aided thereby.

Suitably supported adjacent the inlet passageway is a shaft 12, which has for its purpose the support of a damper. Loosely mounted upon this shaft is a slidable hub 13, which has extending radially therefrom a plurality of vanes 14. For the purpose of giving rigidity and support to the outer ends of the vanes there is provided a ring 15 so attached to the vanes that they are held in proper place and relation to each other and in relation to the parts with which they are associated. The support for the damper shaft is indicated by the numeral 16.

The purpose of this damper is to control the amount of air admitted to the fan housing. It frequently happens in fans of this kind, where the fan and the motor are of the constant speed type, which is the case in this instance, that it is necessary to vary the quantity of air delivered by the fan. It is for that purpose that the damper member is provided in this case. By means of adjusting the damper longitudinally of the shaft 12 the passageway into the fan housing can be restricted or opened at the will of the operator so as to diminish or increase the flow of air into the fan casing and out through the outlet. This damper structure, in cooperation with the shroud, effects the proper control of the air in quantity and in the free and undisturbed exit through the outlet of the casing.

These vanes when assembled may be adjustably positioned on the shaft 12 by a set screw not shown so that the entire assembly of vanes can be withdrawn from the inlet so as not to interfere or affect the air flow when the fan is operating at its maximum volume and pressure at constant speed, but, when it is desired to reduce the pressure and volume without changing the speed, then the vane assembly is moved into the air inlet.

It will be understood that I desire to comprehend within my invention such modifications as may be clearly embraced within my claims and the scope of my invention.

Having thus fully described my invention, what I claim is new and desire to secure by Letters Patent, is:

1. In combination with a housing having a funnel-shaped air passageway with a flared inner end, a fan wheel rotatably mounted in said housing, blades on the outer periphery of said wheel, a shroud curving outwardly and inwardly toward the axis of the wheel and overlapping said flared inner end to form an annular air passageway, and means in the first named passageway to control the passing of air therethrough, said means being independently movable with respect to the air passageways and the air passageway and the shroud being arranged in closely adjacent substantially parallel overlapping relationship at their ends.

2. In combination, a housing having an inlet opening, a fan opposite said inlet opening having an imperforate wall and a plurality of fan blades mounted thereon, a shroud on said blades at their free ends, an inlet passageway projecting into said fan and within the margin of said shroud in closely adjacent spaced relationship therefrom, and a group of air control vanes slidably mounted within said inlet passageway and independently movable with respect to the passageway and the fan.

In witness whereof, I affix my signature.

EDWARD L. ANDERSON.