

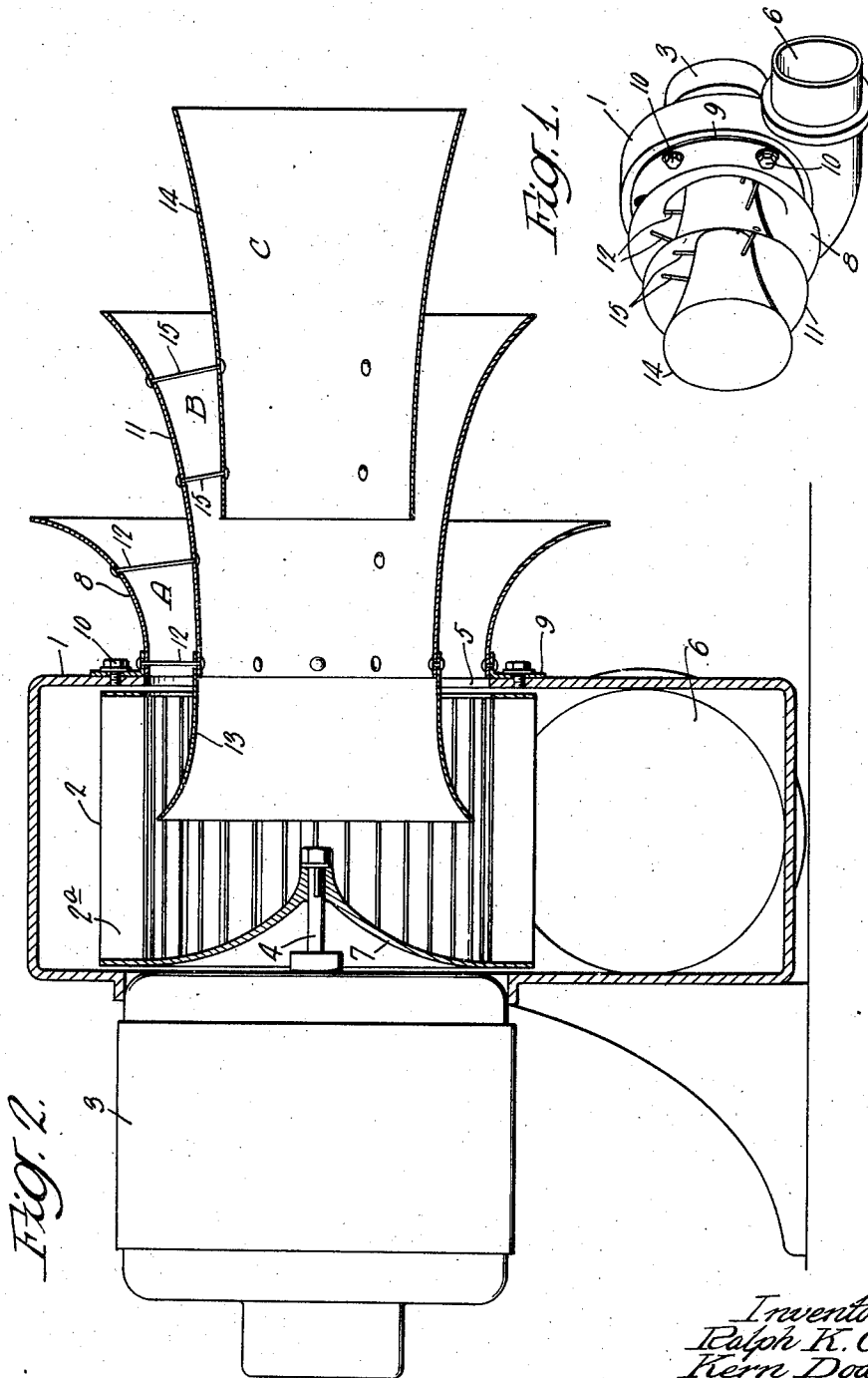
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BLOWER

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BLOWER

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This invention relates to improvements in blowers of the centrifugal type, and a principal object of the invention is to provide means for substantially increasing the air output of a given blower without, however, increasing the power input.

In the attached drawing:

Figure 1 is a view in perspective of a blower assembly made in accordance with our invention, and

Fig. 2 is an enlarged sectional view of the blower showing the details of the invention.

With reference to the drawing, the blower therein illustrated, with certain exceptions hereinafter set forth, is of conventional type. It consists essentially of a convolute casing 1 within which is established a vaned rotor 2. Supported at one side of the casing is an electric motor 3, and in the present instance the rotor 2 is secured to and is supported solely by an extension 4 of the motor shaft which projects into the casing. At the opposite side of the casing from the motor 3 is a circular opening 5 the diameter of which corresponds approximately to the inner diameter of the rotor 2, as measured from the inner edges of the vanes 2a, and the opening 5 constitutes the admission port through which air is drawn into the casing by the action of the rotor. The casing comprises also an exhaust or discharge port 6 which extends in the customary manner in a direction approximately tangential to the rotor. In the operation of a blower of this type, therefore, the air is taken into the interior of the rotor in a substantially axial direction, then moves outwardly in a radial direction to and through the blades of the rotor, and is eventually discharged from the casing through the discharge port. To facilitate movement of the air as described, the inner axial end of the rotor 2, i. e., that end which is relatively remote to the intake opening 5, is formed with a conical baffle 7 which directs the air moving into the rotor in the axial direction outwardly toward the rotor blades. Insofar as described above, the blower is entirely conventional.

In accordance with our invention, we provide at the opening 5 and extending outwardly from said opening in axial alignment with the rotor 2 a tubular assembly which in the illustrated embodiment comprises three funnel-like tubes of differing effective diameters arranged coaxially and in telescoped relation, the larger end of each of the smaller tubes of said assembly projecting from and extending beyond the corresponding end of the next larger tube. In the present in-

stance, the larger of the tubes, 8, is mounted with its inner or smaller end in direct registration with the intake opening 5 of the casing, the tube being connected to the casing through the medium of a flange 9 and screws 10 as illustrated. The inner or smaller end of the tube 8 conforms accurately in size to the said intake opening 5 of the casing. The next smaller tube, 11, of the assembly is suitably supported, as by struts or tie rods 12, within the tube 8, and the tube 11 has an inner flared extension 13 which projects into the interior of the rotor 2 and extends on a smooth curve outwardly into close proximity to the inner periphery of the rotor. The smaller of the tubes of the assembly, designated by the reference numeral 14, terminates in the interior of the tube 11 at a point in the present instance approximately in line with the outer extremity of the tube 8, and the tube 14 may be supported from the tube 11 by means of the struts or tie rods 15 as illustrated.

It will now be apparent that air entering the casing 1 and the interior of the rotor 2 through the tubular assembly described above will be divided, in effect, into two principal components, one of these components entering through the tube 11 and the extension 13 of that tube, and the other component through the tube 8 and between the latter tube and the outer surface of the tube 11. The first of these components is directed to the inner end of the rotor and is guided outwardly between the baffle 7 and the flared end of the extension 13 toward the rotor blades. The second component is directed to the outer end of the rotor, i. e., that end which immediately adjoins the intake opening 5 of the casing, and in this case also the air is directed outwardly by the flared surface of the tubular extension 13 toward the rotor blades. Preferably the elements of the tubular assembly are so relatively proportioned and arranged that the in-drawn air will be distributed with substantial uniformity over the axial length of the rotor blades. To this end, we prefer to form the tubes so that the minimum transverse area of the tube 11 shall be approximately one-half of the corresponding minimum area of the largest tube 8, and the outer or intake ends of the tubes are relatively proportioned and positioned to create substantially equal air-flow capacities in the ducts through which the two aforesaid components of the air intake pass to the rotor. Similarly, the extension 13 of the tube 11 is so proportioned and arranged that its inner edge shall lie in proximity to the blades 2a of the rotor

in a plane normal to the axis of the rotor and intersecting the latter approximately midway of its effective axial length. It will be apparent, however, that a similar more or less uniform distribution of inflowing air to the rotor may be obtained by different relative arrangements and proportions of the tubes, and a corresponding relocation of the extension 13 relative to the axial dimension of the rotor.

In obtaining the aforesaid approximately uniform distribution of incoming air, the contours of the respective tubes play an important part. Where, as in the present instance, the components of the incoming air are designed to be substantially equal, it is desirable that the velocities of said components at the intake port shall also be substantially equal, with a possibly slightly greater velocity in favor of the component entering by way of the passages B and C. Since the air entering through the respective passages must travel over paths of different lengths, the accelerations of the air in the said passages must also differ in order that the terminal velocities may bear the required relation. The contours of the tubes control the acceleration factor. The relatively wide flare of the tube 8 as compared with that of the tube 11, for example, so forms the passages A and B that the acceleration of the air in the former is relatively slow as compared with the acceleration of the air in the latter passage, and a similar relation exists between the passages B and C. In this manner, the passages are designed to afford terminal velocities at the intake port 5 of the casing for the two principal components of the incoming air calculated to give the aforesaid substantially uniform delivery of air to the rotor.

It will be noted that each of the ducts or air passages A, B and C provided by the tubular assembly decreases in effective area toward the inner end, and as a result, the velocity of the air drawn through these passages by the action of the rotor is gradually increased to the point where it enters the casing. This high velocity air, which in itself has a favorable effect upon the efficiency of the blower, is not discharged indiscriminately into the rotor, but is directed and distributed in efficient manner to the rotor blades by the baffle extension 13 to further substantial advantage. The baffle 13 has the property of increasing blower efficiency independently of the other elements of the tubular assembly, but the improvements resulting from the use of the baffle alone, or of the tubes in the absence of the baffle, are of relatively small order as compared with that resulting from use of the entire assembly as described. Furthermore, the improvement resulting from the assembly as a whole is materially greater than the sum of the individual improvements resulting from use alone of the baffle and of the tubes in the absence of the baffle.

As suggested above, the form and relative proportions and arrangement of the elements of the tubular assembly may depart substantially from those illustrated and described without departure from the invention. These factors will be controlled to some extent by the physical and functional characteristics of the particular blower. While desirable, it is not essential, for example, to extend the smaller tubes beyond the end of the largest, and where limitations of available space require, the outer ends of the tubes may terminate in a common plane. A substantial advantage in accordance with the invention may be

realized by use of but two tubes corresponding to the tubes 8 and 11 of the illustrated embodiment; or, in fact, by use alone of the tube 11 with its extension 13. Similarly the number of tubes in the assembly may be increased; and the axial contour of the tubes may also vary considerably from that illustrated without departure from the invention.

We claim:

1. In a blower, a casing having intake and discharge ports, a centrifugal rotor intermediate said ports, a tubular assembly extending outwardly from the intake port of said blower and consisting of a plurality of funnel-like tubes decreasing in cross-sectional area toward said port and assembled in nested and relatively spaced relation one within another so as to afford between each adjoining pair of tubes a longitudinally extending intake channel, the sum of the effective intake areas of all the channels through said assembly as measured in the planes of the outer ends of the respective tubes being materially in excess of twice the area of the intake port of said casing.

2. In a blower, a casing having intake and discharge ports, a centrifugal rotor intermediate said ports, a tubular assembly extending outwardly from the intake port of said blower and consisting of a plurality of funnel-like tubes decreasing in cross-sectional area toward said port and assembled in nested and relatively spaced relation one within another so as to afford between each adjoining pair of tubes a longitudinally extending intake channel, the cross-sectional area of said channel decreasing toward the said intake port, and the sum of the effective intake areas of all the channels through said assembly as measured in the planes of the outer ends of the respective tubes being materially in excess of twice the area of the intake port of said casing.

3. In a blower, a casing having intake and discharge ports, a centrifugal rotor intermediate said ports, a tubular assembly extending outwardly from the intake port of said blower and consisting of a plurality of funnel-like tubes decreasing in cross-sectional area toward said port and assembled in nested and relatively spaced relation one within another so as to afford between each adjoining pair of tubes a longitudinally extending intake channel, the inner tube of each adjoining pair extending beyond the outer end of the outer tube of said pair, and the sum of the effective intake areas of all the channels through said assembly as measured in the planes of the outer ends of the respective tubes being materially in excess of twice the area of the intake port of said casing.

4. In a blower, a casing having intake and discharge ports, a centrifugal rotor intermediate said ports, a tubular assembly extending outwardly from the intake port of said blower and consisting of a plurality of funnel-like tubes decreasing in cross-sectional area toward said port and assembled in nested and relatively spaced relation one within another so as to afford between each adjoining pair of tubes a longitudinally extending intake channel, and baffle means in the interior of said rotor arranged to direct the fluid entering the casing by way of said channels to predetermined circumferential areas of said rotor.

5. In a blower, a casing having intake and discharge ports, a centrifugal rotor intermediate said ports, a tubular assembly extending outwardly from the intake port of said blower and con-

sisting of a plurality of funnel-like tubes decreasing in cross-sectional area toward said port and assembled in nested and relatively spaced relation one within another so as to afford between each adjoining pair of tubes a longitudinally extending intake channel, and means in the interior of said rotor for predeterminedly distributing the fluid entering the casing by way of said channels to the rotor.

6. In a blower, a casing having intake and discharge ports, a centrifugal rotor intermediate said ports, a tubular assembly extending outwardly from the intake port of said blower and consisting of a plurality of funnel-like tubes decreasing in cross-sectional area toward said port and assembled in nested and relatively spaced relation one within another so as to afford between each adjoining pair of tubes a longitudinally extending intake channel, and means in the interior of said rotor for predeterminedly distributing the fluid entering the casing by way of said channels to the rotor, said distributing means comprising a tubular baffle extending from the inner end of

one of said tubes into proximity to the inner periphery of said rotor.

7. In a blower, a casing having intake and discharge ports, a centrifugal rotor intermediate said ports, and a tubular member mounted in and spaced from the peripheral edge of said intake port, said member flaring inwardly and having its inner peripheral edge in proximity to and in a radial plane intermediate the ends of said rotor, the said member extending outwardly from said intake port and increasing in diameter toward the outer extremity.

8. In a blower, a casing having intake and discharge ports, a centrifugal rotor intermediate said ports, annular means dividing said intake port into a plurality of concentric intake areas, said means comprising at least one duct extending outwardly from said port and increasing in diameter toward its outer extremity, and means in the interior of said rotor for connecting said areas individually with different axial sections of said rotor.

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