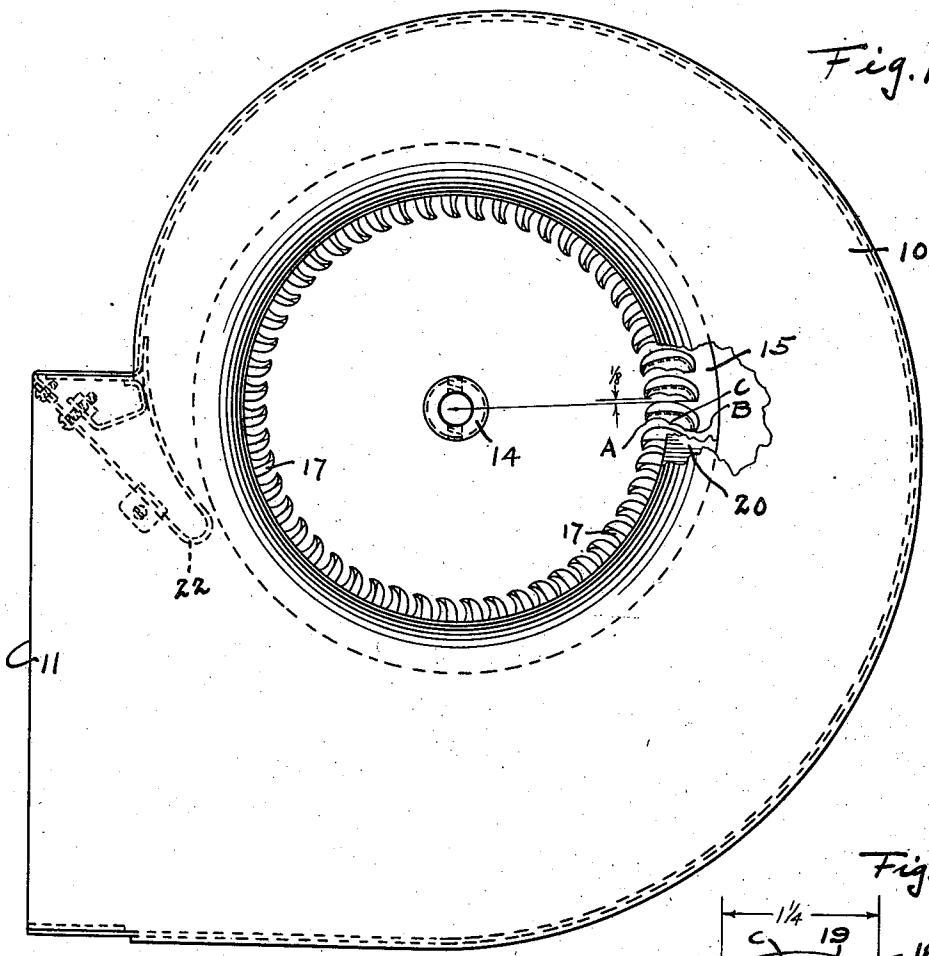
Feb. 5, 1946. V. E. SPROUSE 2,394,214

BLOWER

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Fig. 1.



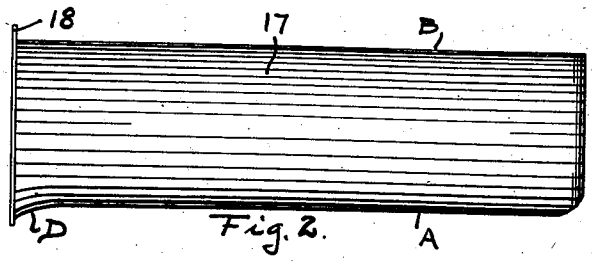


Fig. 2.

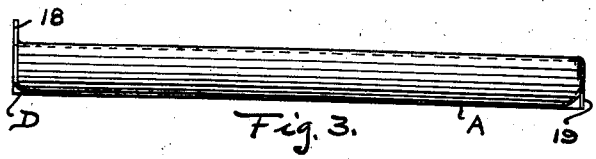


Fig. 3.

Fig. 4.

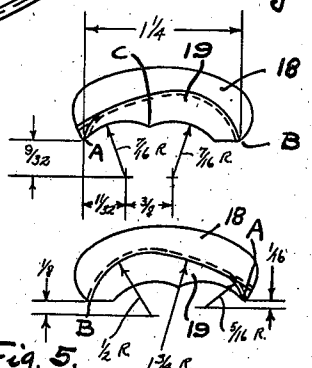


Fig. 5.

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BLOWER

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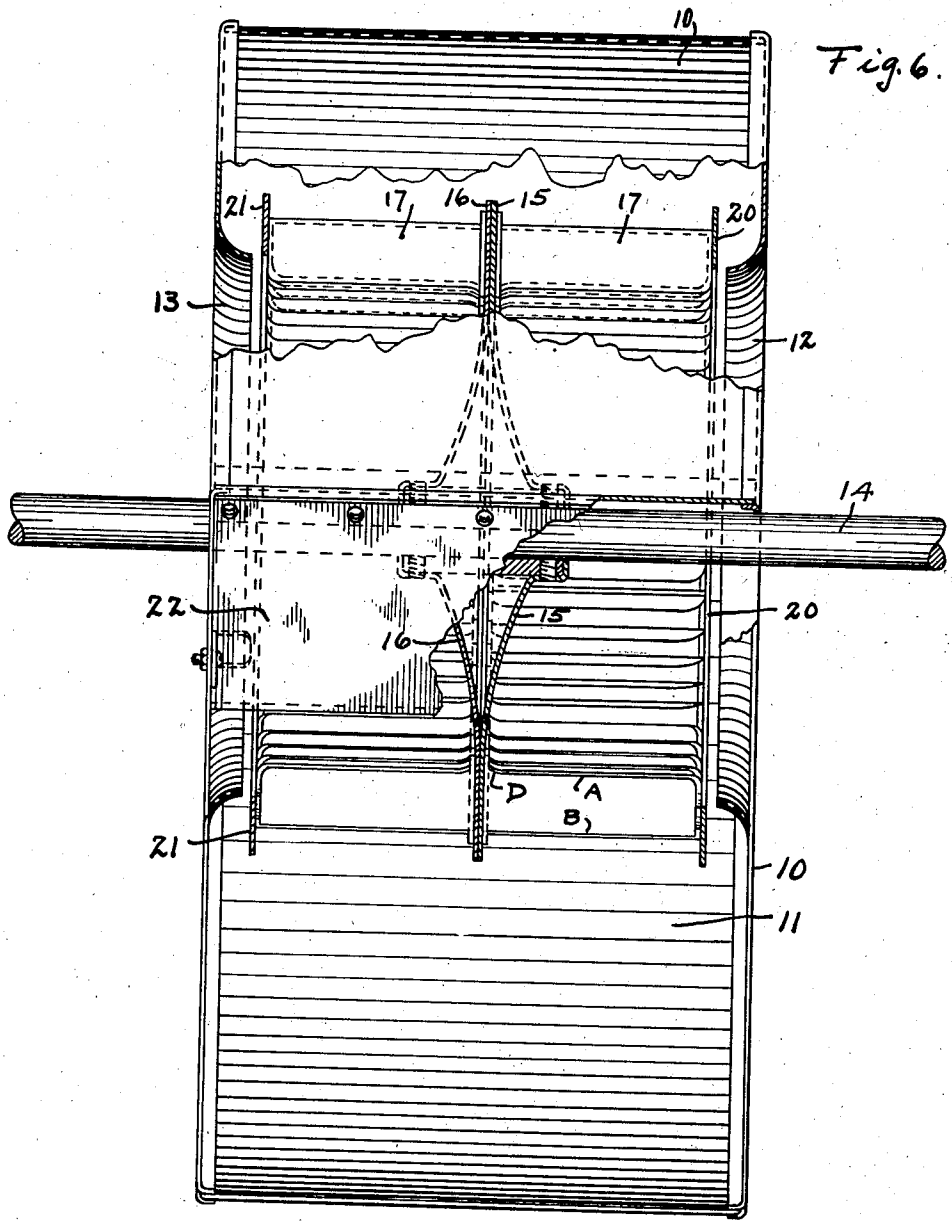


Fig. 6.

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UNITED STATES PATENT OFFICE

2,394,214

BLOWER

Verner E. Sprouse, Columbus, Ind.

Application June 5, 1944, Serial No. 538,718

5 Claims. (Cl. 230—134)

This invention relates to a blower particularly of that type which will have a high volume discharge up to several inches of water pressure.

A primary advantage of the invention is that by reason of the particular construction, there is simultaneously secured a quiet inlet condition; a high pressure building mid-section of the blades; and a high volume discharge. Further, by reason of the construction of the blades and their mounting a full loading of the blades is secured entirely back to the inner ends thereof. By using a larger inlet opening ring than the diameter of the blade inlet edges, leaving uncovered parts of the ends of the blades, an improvement in inlet conditions is secured. Also there is the advantage obtained by extension of the blade mounting back plate and the outer blade engaging ring to form radially extending flanges from the blades whereby a better delivery of air against pressure promotes increased efficiency of the rotor.

Other advantages of the invention are gained from the construction to permit use of blades of much thinner steel than is found in the heretofore used rotors, all without loss of mechanical strength and air delivery efficiency; rigid mounting of the blades even in long units without requiring use of bracing rods; in general the use of like stampings throughout; and such other advantages as will become apparent to those skilled in the art in the following description of one particular form of the invention as illustrated in the accompanying drawings, in which

Fig. 1 is a view in side elevation of a structure embodying the invention;

Fig. 2, a view in back side elevation of a blade on an enlarged scale;

Fig. 3, a view in leading edge elevation of the blade on an enlarged scale;

Fig. 4, a view in elevation of the inlet end of the blade on an enlarged scale;

Fig. 5, a view in rear end elevation of the blade on an enlarged scale; and

Fig. 6, a view in discharge end elevation and partial section of the blower.

Like characters indicate like parts throughout the several views in the drawings.

In the present showing of the invention a double axial inlet type of blower is employed. A scroll 10 is formed out of suitable material, such as sheet metal to have a discharge end opening 11 and circular inlet openings 12 and 13 on the sides. These openings 12 and 13 appear between curved-in side wall flanges of the scroll 10.

Suitably mounted to rotate in bearings (not shown) axially of the openings 12 and 13 is a rotor shaft 14. A pair of generally frusto-conical plates 15 and 16 are centrally disposed between the inner ends of the flanges forming the openings 12 and 13, in fixed engagement along and with the shaft 14. These plates 15 and 16 are mounted as indicated in Fig. 6 to have their peripheral base portions in abutment and preferably secured one to the other by any suitable means, such as welding. The outer peripheral portions of the plates 15 and 16 present planar surfaces perpendicular to the axis of the shaft 14.

Around these peripheral portions in closely spaced relation are mounted and secured thereto a plurality of blades 17. These blades extend from the respective plates 15 and 16 in general parallel alignment with shaft 14 outwardly toward the respective openings 12 and 13.

Referring particularly to Figs. 2 and 5, each of these blades 17 has an inner end mounting flange 18 formed to turn from the rear or trailing side of the blade and to bear against the respective plates 15 and 16 as the case may be. In the present form of the invention this flange 18 is spot welded to the plates 15 and 16 in each instance. The blade is generally arcuate in shape but has portions thereof of different radii as opposed to the heretofore generally employed constant radius of curvature blade.

The blade 17 has a straight inner edge A parallel to the axis of the shaft 14. From this edge A the blade curves backwardly with a $\frac{5}{16}$ unit radius, Fig. 5, to have its leading face merge into the flatter curved zone of 1¾ unit radius, which flatter area extends over a major part of the leading side of the blade. From this flatter area, the blade curves around more sharply by a ½ unit radius to the outer edge B. These dimensions are maintained substantially throughout a wide range of diameters of rotors. In the present showing of the invention a blade having the configuration described in accordance with the dimensions named is used in a 12 inch diameter rotor. Lengths of the blades 17 will vary depending upon the volume of discharge desired.

The inlet end of the blade, Fig. 4, is provided with an inturned flange 19, that is turned in the opposite direction from the inner mounting flange 18. This flange 19 is cut away as indicated in Fig. 4 to have a curvature of $\frac{7}{16}$ unit radius from the edge A back to a point C, from which the flange 19 extends in substantially full width around to the outer edge B. The dimensions indicated in Figs. 4 and 5 are maintained rather closely to give the desired blower blade efficiency. Preferably the inner and outer edges of the blade 17 are rounded to be free of any burrs or roughness. In the present form of the invention, the blades 17, by reason of their shape and contour can be made of stainless steel down to .010 inch in thickness. The blades 17 are located around the respective plates 15 and 16 to have their inner edges ⅛ unit back of a radial line across the outer edge, Fig. 1.

After the desired number of blades 17 are

mounted to extend laterally in each direction respectively from the plates 15 and 16 inlet rings 20 and 21 are respectively mounted over the outer inlet ends of the blades. Each of these rings 20 and 21 is a planar metal disk having a central portion removed to leave an opening therethrough having a diameter to position the inner edge of each ring to coincide with the point C of each of the blades so as to leave the inlet end of the blades 17 exposed, from that point C to the point A within the opening of the ring. Likewise the inturned flanges about the openings 12 and 13 of the scroll terminate to leave the diameters of the openings 12 and 13 that of the opening diameters of the rings 20 and 21. Any suitable means may be employed to rigidly secure the rings 20 and 21 to the inlet ends of the blades 17, such as by spot welding the rings to the flanges 19, the flat surfaces therebetween forming good seats to prevent any twisting or skewing action of the blades when in operation at fairly high speeds.

Another feature to be emphasized is that each blade 17 has its inner edge A adjacent the flange 18 flared or rounded back as at D, Figs. 2 and 3. This slight change from the straight line edge aids considerably in loading the blade for its full length.

The central plates 15 and 16 and also the inlet rings 20 and 21 extend radially beyond the blades 17 for a distance in the nature of flanges to permit a full volume of air delivery against pressures higher than would otherwise be reached, permitting some velocity to be converted into pressure therebetween and within the scroll.

Back within the discharge opening 11 of the scroll 10 is mounted an adjustable throat member 22 comprising essentially a plate extending angularly inwardly and downwardly from the upper transverse edge of the scroll opening and turning around and toward the rings 20 and 21 to extend thereacross and finally continue around forwardly and upwardly to join with the curved wall of the scroll. The exact shape and mounting of this member 22 does not form a part of the present invention.

By reason of the conical shape of the plates 15 and 16 between the inner ends of the blades 17 therearound, and further aided by the curved portion D of the inner edges of the blades the flow of the air upon intake through the openings 12 and 13 is so directed as to insure a full flow throughout the lengths of the edges A whereby the full capacities of the blades 17 are utilized all without any substantial interference by eddying of air at the inner ends of the blades and their inner edges. Obviously a blower of a single set of rotors may be employed, such as with plate 15 in the absence of plate 16 where smaller volumes are to be handled. The same general efficiency however is maintained within the capacity of the rotor.

While the invention has been herein shown and described in more or less detail, it is obvious that structural variations may be employed, such as in the mounting of the blades and in the construction of the scroll all without departing from the spirit of the invention (the blades, however, being substantially confined to the dimensions set forth), and I, therefore, do not desire to be limited to that precise form beyond the limitations as may be imposed by the following claims.

I claim:

1. A blower rotor blade having a generally straight inner edge, the surface of the blade curving rearwardly from its inner edge by substantially a $\frac{5}{16}$ unit radius to merge into a major area of substantially 1¾ units radius, from which major area, the surface curves forwardly by substantially a ½ unit radius to the outer edge, the distance between the inner and outer edges being substantially 1¼ units.

2. In a blower, a rotor base plate; a plurality of blades mounted by ends circumferentially around the plate; each of the blades having an inner edge from which the forward surface curves rearwardly into a major area of flatter curvature, from which the surface curves around forwardly to the outer edge by a radius exceeding that of the surface adjacent the inner edge; and each of said blades being located around said plate to have its inner edge back of a plate radius line across the blade trailing edge; said surface adjacent the inner edge having approximately a $\frac{5}{16}$ unit radius, the major area, approximately a 1¾ units radius, and the surface adjacent the outer edge, approximately a ½ unit radius.

3. In a blower, a rotor base plate; a plurality of blades mounted by ends circumferentially around the plate; each of the blades having an inner edge from which the forward surface curves rearwardly into a major area of flatter curvature, from which the surface curves around forwardly to the outer edge by a radius exceeding that of the surface adjacent the inner edge; and each of said blades being located around said plate to have its inner edge back of a plate radius line across the blade trailing edge; said surface adjacent the inner edge having approximately a $\frac{5}{16}$ unit radius, the major area, approximately a 1¾ units radius, and the surface adjacent the outer edge, approximately a ½ unit radius; the spacing of the leading edge back of said radius line being approximately ⅛ unit.

4. In a blower, a rotor base plate; a plurality of blades mounted by ends circumferentially around the plate; each of the blades having an inner edge from which the forward surface curves rearwardly into a major area of flatter curvature, from which the surface curves around forwardly to the outer edge by a radius exceeding that of the surface adjacent the inner edge; and each of said blades being located around said plate to have its inner edge back of a plate radius line across the blade outer edge; and an inlet ring secured around and across the inlet ends of the blades, the inner edge of the ring being substantially on a circumferential line approximately centered across said blade major areas to leave blade ends exposed through the ring.

5. For a pressure type blower with a squirrel cage type rotor, a blade curved throughout its surface from its inner to its outer edge, both of said edges being substantially parallel to the axis of blade revolution and the elements in the blade surface being parallel throughout its width between said edges, said blade being further characterized by a major perceptibly curved area, from the inner side of which area the blade curves sharply forwardly to said inner blade edge by a radius of curvature less than that of said major area, and from the outer side of which major area the blade curves forwardly to the outer blade edge by a radius of curvature less than that of said major area and greater than that of said inner edge curved area.

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