May 27, 1924. 1,495,873

B. SCHMELZER

FAN OR IMPELLER

Filed Aug. 9, 1922

Fig. 2.

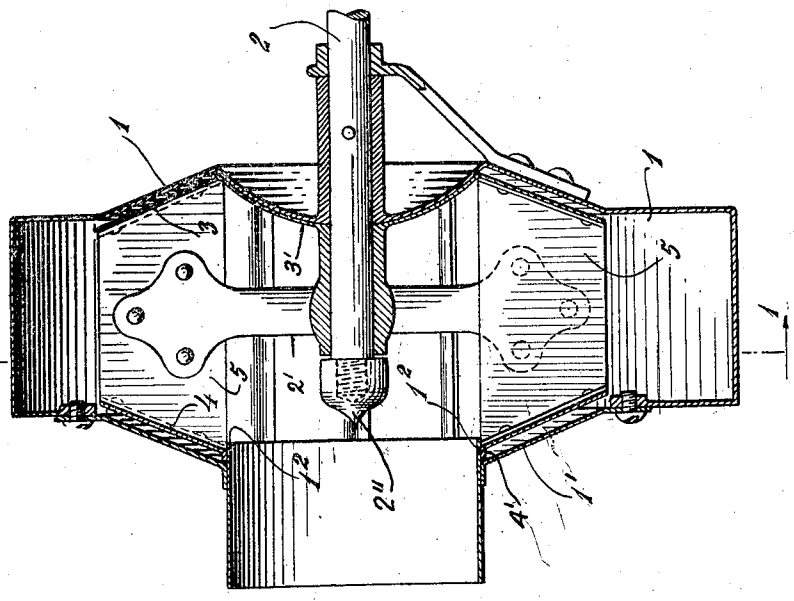
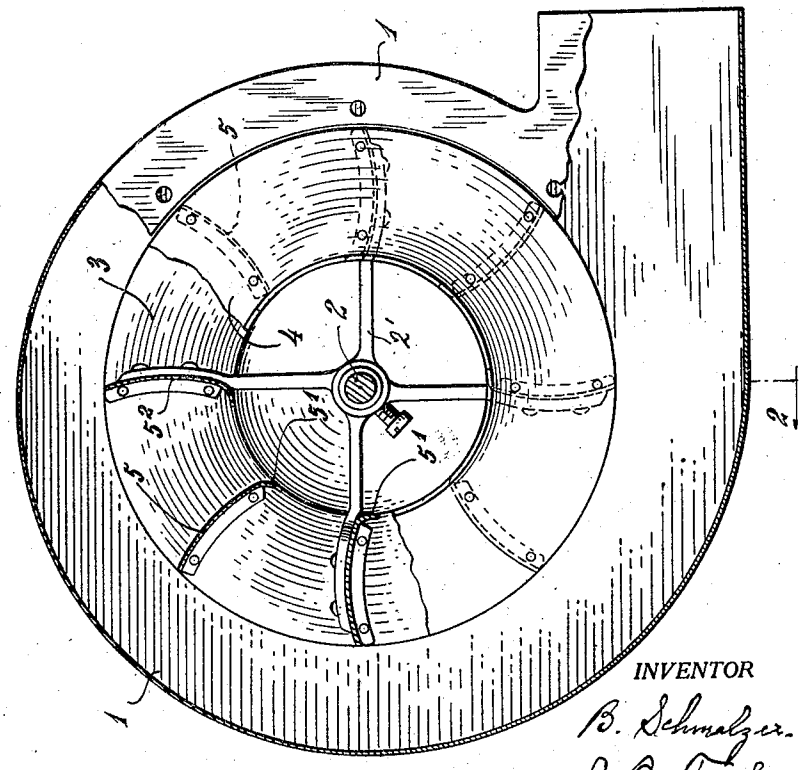


Fig. 1.



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UNITED STATES PATENT OFFICE.

BRUNO SCHMELZER, OF JERSEY CITY, NEW JERSEY.

FAN OR IMPELLER.

Application filed August 9, 1922. Serial No. 580,785.

To all whom it may concern:

Be it known that I, BRUNO SCHMELZER, a citizen of Poland, and resident of Jersey City, in the county of Hudson and State of New Jersey, have invented a certain new and useful Fan or Impeller, of which the following is a specification, the same being a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention which constitutes the subject matter of this application relates to improvements in centrifugal fans, compressors, air and gas pumps, fan blowers, and other kindred apparatuses which are hereinafter designated as fans; and its has for its object the provision of an improved construction of that type of fan wherein a flow of air, water or other fluid (hereinafter referred to as air) is discharged from the fan wheel.

Another object of the invention is to increase the efficiency of such fans and to eliminate the noise ordinarily incident to the operation thereof.

In many centrifugal fans where the air is taken in axially and discharged circumferentially the current which is discharged from the back or disk portion of the blades has a tendency to cross over toward the intake end and to re-enter the interior of the fan centripetally, and I have therefore designed my fan so that the fluid that passes through and is discharged from the outer portion of the blades is taken from the suction or intake side of the fan, instead of being to a considerable extent a re-circulation back from the discharge side, whereby by my invention the air entering centripetally through the inner end of the blades and passing axially between or along the same is discharged centrifugally from the outer portion of the blades without any objectionable re-circulation thereof, thus enabling the fan to operate with a maximum efficiency and without undue noise.

The noise produced by high speed centrifugal fans is also ordinarily caused by the fluid being forced to pass over sharp edges whereupon it ceases to flow smoothly and becomes broken up into whirls or eddies thus forming a turbulent mass. By rounding the rear edges of the blades where the air is drawn in by suction and concaving the anterior face of said blades an unobstructed channel for the even and steady movement of the fluid is provided, thereby avoiding the setting up of any sharp edges to interfere in any manner with the smooth passage of the current.

Another source of excessive noise in such fans is the formation of thin blasts of air passing laterally by the fan blades and between the same and the casing, which blasts conflict with the normal centrifugal flow of the current and produce eddies and vortices in the air movement and cause back pressure. Again, interstices between the fan wheel and the casing, or irregularities in the inner face of the latter, serve in many fans to constitute pockets in which air is compressed by the centrifugal current and, on account of the tendency of such air cushions to expand against the said current, friction is created which develops a harsh and severe noise. My fan wheel made with truncated cone shape side portions which conform in contour with the casing will eliminate the above named disadvantages.

With the above considerations in mind and with a view of overcoming the objections pointed out, I have devised the fan illustrated in the accompanying drawings, in which—

Figure 1 represents an elevation of a fan constructed according to my invention; and

Figure 2 is a transverse section of the same.

As one example or embodiment of the invention I have illustrated the same as applied to a radial flow fan in which the fluid operated upon enters axially and centrally in the inlet and is discharged circumferentially at the outlet of the casing or housing. The fan wheel comprises a disk or back plate or wall 3 forming a convex deflector 3′ and a shroud, ring, annulus or forward wall 4, intermediate of which are positioned a plurality of impeller blades 5.

The fan wheel comprises approximately radial spokes or arms 2′ carried by a shaft 2 which works in a casing 1. The back plate 3 and shroud 4 and outer portions of the said arms are preferably of cone-shaped contour, the fan wheel thus comprising truncated cone shaped side portions. The blades are consequently made with preferably outwardly converging edges. The inner portion of the shroud terminates in a flat horizontal ring 4′.

The interior face of the casing is preferably so formed as to correspond with the said

contour of the fan wheel both in longitudinal and cross section through any blade, and the side wall or head 1′ of the casing at the intake end of the blades is preferably detachable and made with an inlet tube 1^2 projecting into and beyond the said ring 4′.

The inner ends 5′ of the blades project forwardly so that the air when drawn in by suction will not strike a sharp edge, and the impeller blades are preferably of substantially radial position, and the anterior faces of the same as well as the outer portions of the arms 2′ are preferably concaved as at 5^2 so as to afford a smooth and easy passage of the current, although the same may be of different inclination, curvature or thickness without departing from the principle of my invention which is applicable to other types of blades.

The fluid entering the intake end of the fan passes by the pointed end 2″ of the shaft 2 forming a conical deflector and is carried around between the back plate or disk and shroud and discharged without striking or impinging upon adverse air currents such as are contained in the recessed portions or pockets ordinarily present in fan casings or housings or meeting any obstruction or opposing element whatever and also without having any chance to enter the intake again and to re-circulate. By my conical fan wheel the air is guided from the intake side to the centre of the casing from which it is peripherally discharged in a strong and even flow of current.

On account of the air entering within the plane of the adjacent side of the fan wheel and crossing a portion of the interior edges of the blades by the use of the tubular inlet 1^2 there is no obstruction of the fluid in its normal axial progress within the boundary of the fan as the arms 2′ do not interfere with the free movement of the fluid. By this arrangement of parts no dust can enter or collect in the fan wheel, while the positioning of the disk so near the adjacent stationary outer-wall of the casing also prevents any dust or dead air from collecting therebetween.

The fan wheel cannot be distorted or become deformed as the disk and shroud are attached to the blades and the structure is also strengthened by the outer ends of the arms 2′ which, together with the blades are concaved whereby great stiffness and rigidity are attained. The outer portions of the disk and shroud and also the casing extend inwardly in cone-shaped contour to the outer edge of the blades to correspond with the converging edges of the blades. By reason of the circumferential channel of the casing being narrowed near its outer portion so as to be of the same width as the exterior edges of the blades a contracted channel continuing of the same diminished width to the outlet of the casing is formed and consequently a concentrated blast is secured, while at the same time on account of my peculiar construction of parts there are no air cavities in my device to set up friction against the current flow or to cause any of the said air current to become choked backward at any point of the movement of the fluid.

I wish to have it understood that I do not desire to be limited to the particular use or the exact details of construction shown and described, for obvious modifications will occur to persons skilled in the art.

What I claim as my invention is:—

1. In a device of the class described, a casing comprising unobstructed inlet and outlet open mouths, a fan wheel having a fan shaft with a single set of spokes lying in the central plane of the wheel and provided with concave blades supported thereby, the fan wheel having an open channel therethrough at and between the inner edges of the blades of substantially the diameter of the inlet wherein the air entering axially is caused to gradually rotate circumferentially before being acted upon in said channel by the wheel to avoid air-pocket resistance, the said blades having inner edges adapted to cut the surrounding air edgewise with a wedging action in the path of travel, the casing lying sufficiently near the sides of the wheel as to prevent back pressure or suction resistance therebetween to avoid harsh noises from emanating from the fan.

2. In a device of the class described, a casing comprising unobstructed inlet and outlet open mouths, a fan wheel having a fan shaft with a single set of spokes lying in the central plane of the wheel and provided with concave blades supported thereby, the fan wheel having an open channel therethrough at and between the inner edges of the blades of substantially the diameter of the inlet wherein the air entering axially is caused to gradually rotate circumferentially before being acted upon in said channel by the spokes to avoid air-pocket resistance, the said blades having forwardly curved inner edges adapted to cut the surrounding air edgewise with a wedging action in the path of travel, the casing lying sufficiently near the sides of the wheel as to prevent back pressure or suction resistance therebetween to avoid harsh noises from emanating from the fan.

3. In a device of the class described, a casing comprising inlet and outlet open mouths, a fan wheel having a fan shaft and provided with concave blades supported therein, the fan wheel having an open channel therethrough at and between the inner edges of the blades of substantially the diameter of the inlet wherein the air entering axially is caused to gradually rotate circumferentially by suction to avoid air-pock-

et resistance, the said blades having inner edges dapted to cut the surrounding air edgewise with a wedging action in the path of travel, the casing lying sufficiently near the sides of the wheel as to prevent back pressure or suction resistance therebetween to avoid harsh noises from emanating from the fan, the blades of the fan wheel being positioned intermediate a disk and shroud and having outwardly converging edges, and the adjacent parts of the casing lying close to and parallel therewith the entire extent of said edges, the shroud terminating in a ring concentric with the inlet and the latter projecting into the said open channel, the ring and open channel being substantially of the same diameter.

4. In a device of the class described, a casing comprising inlet and outlet open mouths, a fan wheel having a fan shaft and provided with concave blades supported therein, the fan wheel having an open channel therethrough at and between the inner edges of the blades of substantially the diameter of the inlet wherein the air entering axially is caused to gradually rotate circumferentially by suction to avoid air-pocket resistance, the said blades having inner edges adapted to cut the surrounding air edgewise with a wedging action in the path of travel, the casing lying sufficiently near the sides of the wheel as to prevent back pressure or suction resistance therebetween to avoid harsh noises from emanating from the fan, the blades of the fan wheel being positioned intermediate a disk and shroud and having outwardly converging edges, and the adjacent parts of the casing lying close to and parallel therewith the entire extent of said edges, the end of the fan shaft carrying a conical deflector and the disk having a convex portion rotating within the said open channel to provide deflecting means of larger diameter to create an increased flow of air thereat, said convex portion conforming to the contour of the adjacent part of the casing.

5. In a device of the class described, a casing comprising unobstructed inlet and outlet open mouths, a fan wheel having a fan shaft and provided with concave blades supported thereby, the fan wheel having an open channel therethrough at and between the inner edges of the blades of substantially the diameter of the inlet wherein the air entering axially is caused to gradually rotate circumferentially before being acted upon in said channel by the wheel to avoid air-pocket resistance, the said blades having inner edges adapted to cut the surrounding air edgewise with a wedging action in the path of travel, the casing lying sufficiently near the sides of the wheel as to prevent back pressure or suction resistance therebetween to avoid harsh noises from emanating from the fan, the blades of the fan wheel being positioned intermediate a disk and shroud and having outwardly converging edges, and the adjacent parts of the casing lying close to and parallel therewith the entire extent of said edges, the outlet channel of the casing being eccentric with respect to the fan wheel and of the width of the narrow outer edges of the blades and continuing of the said contracted width to the mouth thereof and being narrowest just above the said mouth.

Signed at New York in the county of New York and State of New York this 23rd day of June A. D. 1922.

BRUNO SCHMELZER.