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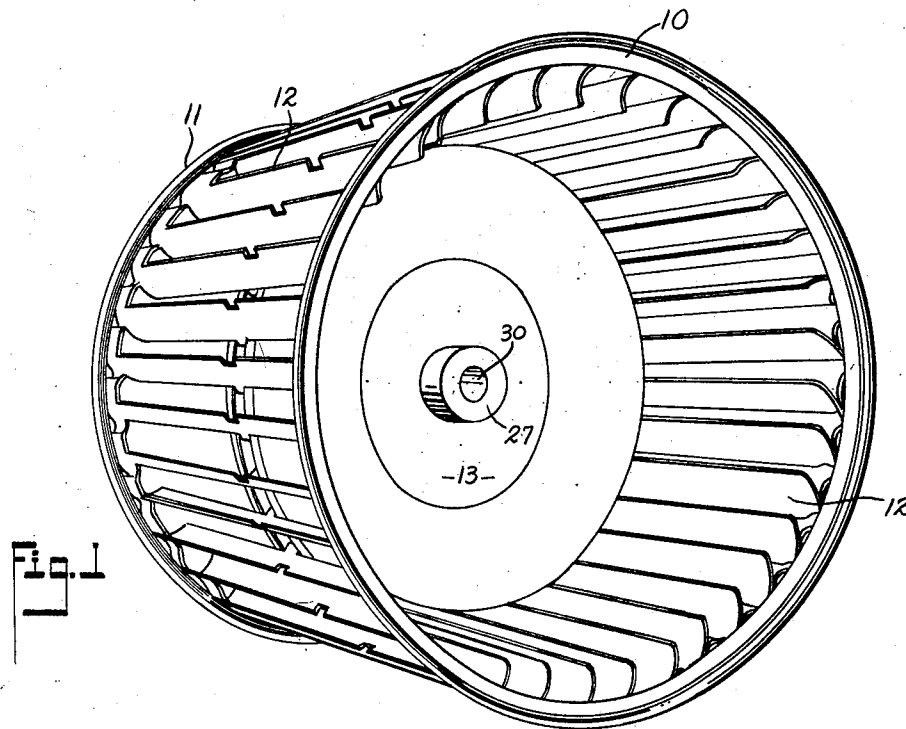
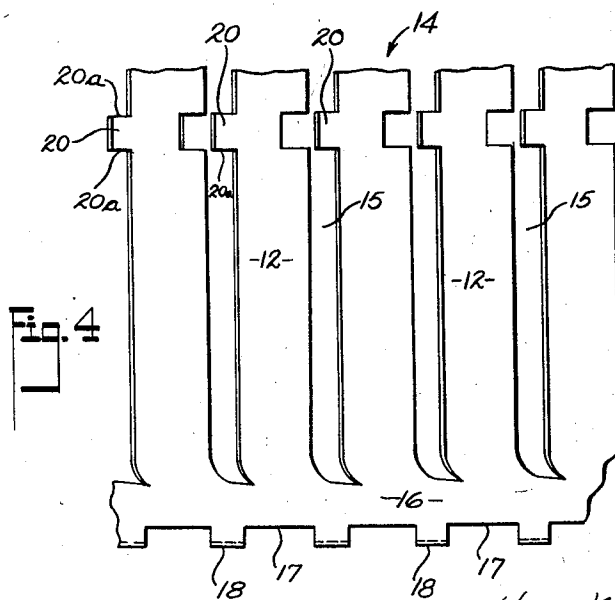
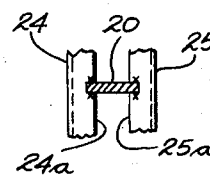
P. BORKAT

2,915,239

BLOWER

Filed Oct. 18, 1954

3 Sheets-Sheet 1



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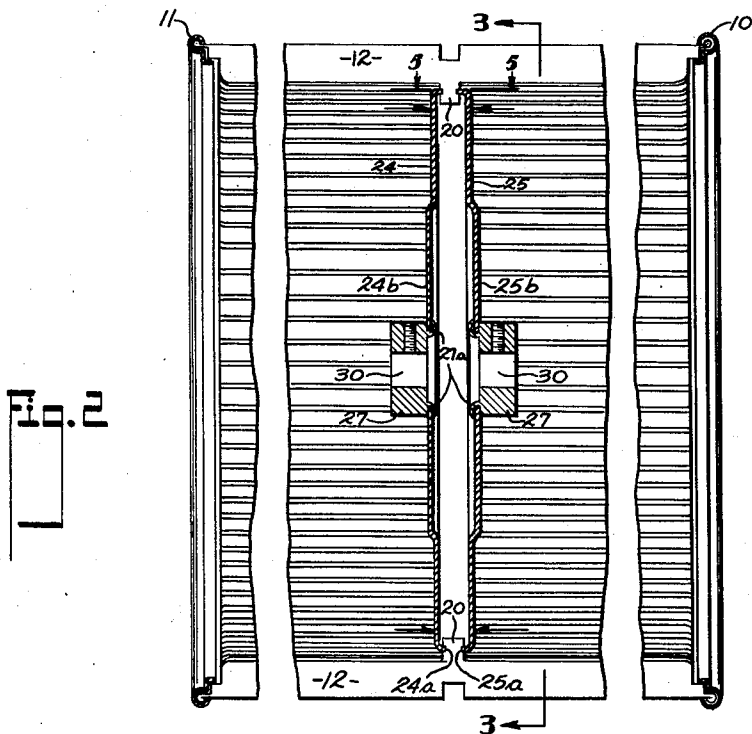
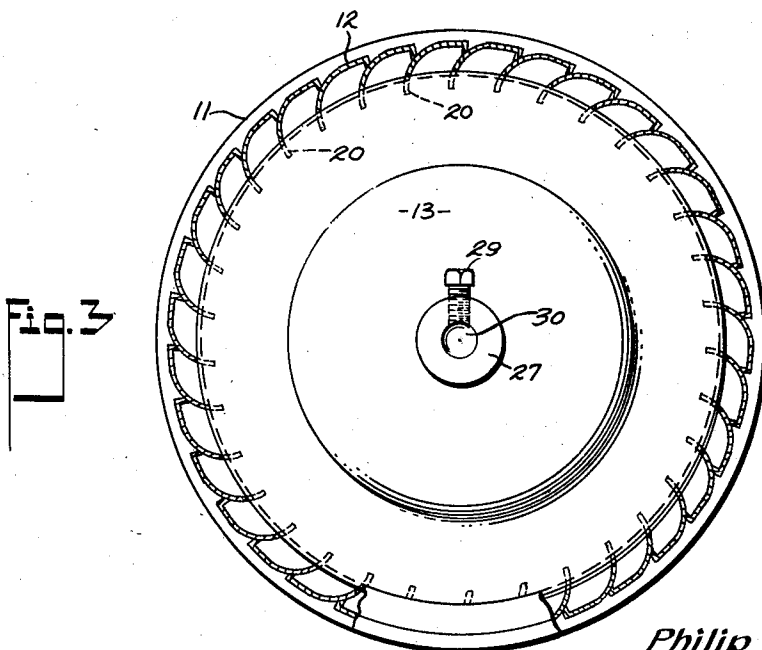
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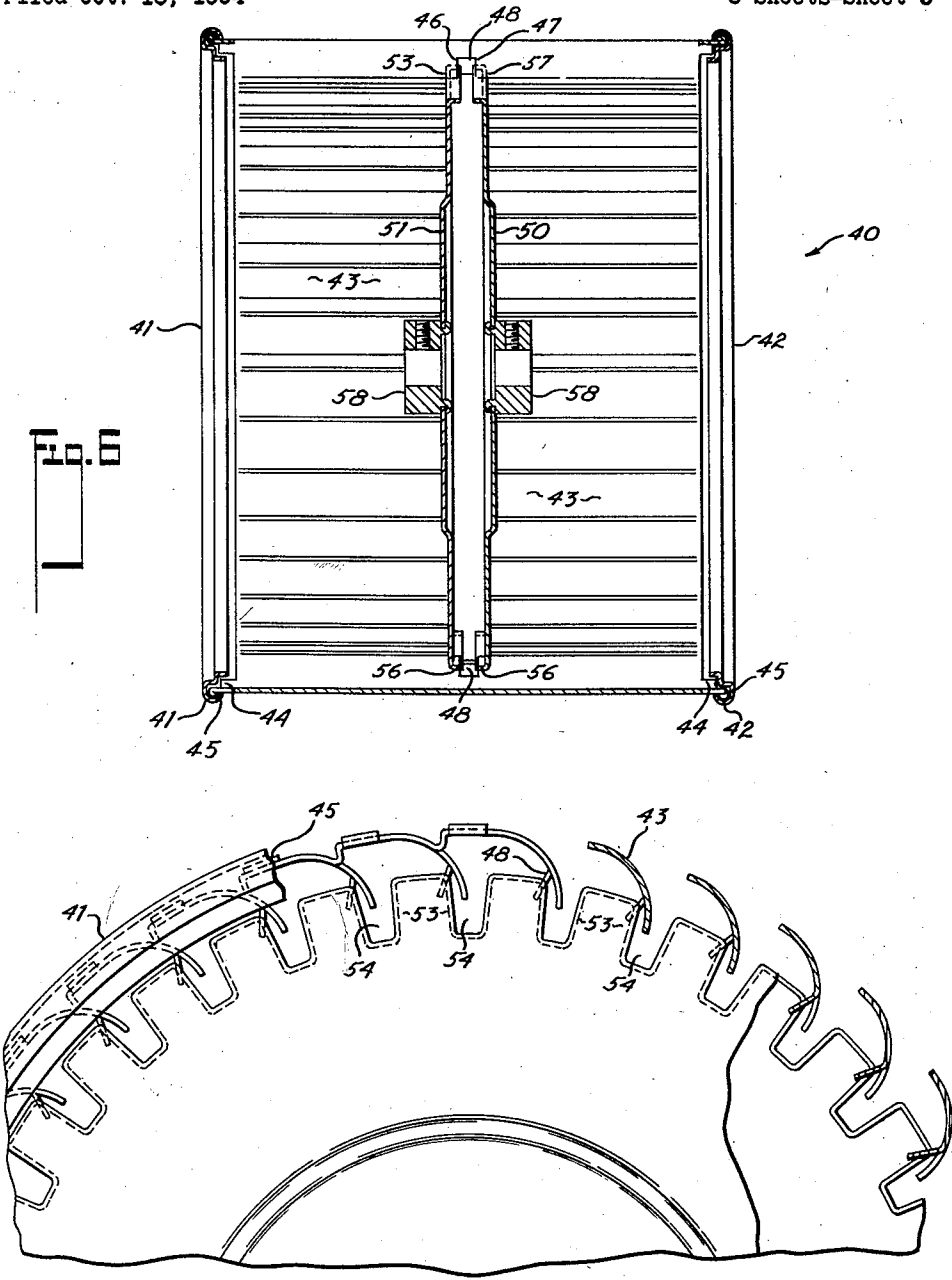


Fig. 7

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2,915,239

BLOWER

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4 Claims. (Cl. 230—134)

This invention relates to rotors for centrifugal fans having a plurality of circumferentially spaced blades and known as blowers and more particularly to improved means for securing driving disks within such blowers.

An object of this invention is to provide a driving disk for a centrifugal blower wherein the driving disk has its peripheral portion secured to intermediate portions of the blower.

Another object of this invention is to provide a driving disk for a centrifugal blower in which the elements of the blower and disk are themselves formed into an interlocking securement to produce an unusually rigid structure.

Still another object of this invention is to provide novel means of assembling a driving disk within a centrifugal blower wheel at a point intermediate the ends of said blower, so that air may be taken in from both ends of the blower and thereby greatly increase its efficiency.

Another object of the present invention is to provide a centrifugal blower having a driving disk secured intermediate its ends, characterized by its structural simplicity, the ease of assembly of its parts, its strong and sturdy nature and its low manufacturing cost. Other features reside in the arrangement and design of the parts for carrying out their appropriate functions.

Other objects and advantages of this invention will be apparent from the accompanying drawings and description and the essential features will be set forth in the appended claims.

In the drawings:

Fig. 1 is a perspective view of a cylindrical rotor for a centrifugal blower which embodies the fundamental concept of our invention.

Fig. 2 is a vertical sectional view taken through a diameter of the rotor with parts broken away.

Fig. 3 is a vertical sectional view taken along the plane of line 3—3 in Fig. 2.

Fig. 4 is an enlarged fragmentary view illustrating a portion of a member which may be employed in fabricating the rotor.

Fig. 5 is an enlarged fragmental sectional view taken along the plane of line 5—5 in Fig. 2.

Fig. 6 is a vertical sectional view taken through a diameter of another embodiment of my novel rotor.

Fig. 7 is a vertical sectional view taken at various zones progressively inward from the end of the rotor shown in Fig. 6.

Referring to Fig. 1, in which I have illustrated a preferred embodiment in the present invention, the blower wheel comprises a pair of spaced end rings 10 and 11 which support a multiplicity of elongated blades 12 which are circumferentially arranged about a central axis. A driving disk 13 is shown mounted within the blower wheel intermediate its end portions so that air may be taken in from both ends of the blower, thereby greatly increasing its capacity and efficiency.

Referring now to Fig. 4, the cylindrical body portion of the blower wheel, from which the blades are formed

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and by which they are carried, is preferably developed from a single rectangular strip 14 (not shown in its entirety) of sheet material. The individual blades are formed in the rectangular sheet material by cutting slits 15 in the strip in a direction transverse to the longer dimension thereof. This may be done by either one or a series of punching or stamping operations. The generally rectangular sheet 14 is imperforate in the zone just beyond the ends of the blades, thereby providing lateral margins 16 which interconnect the blades 12 at the opposite ends thereof. The longitudinal edges 17 are cut to provide tabs 18 which extend in an axial direction outwardly from the ends of the lateral margins 16. Each blade 12 is provided intermediate its ends with a protruding lug 20 cut out of the material forming the adjacent blade. The metal between the transverse slits 15 is bent out of the plane of the rectangular strips so as to form blades 12 in such a manner that the protruding lugs 20 will extend radially inwardly after the entire rectangular strip has been shaped to form a cylinder of such size as to fit inside the end rims 10 and 11.

In the assembly of the blade after the strip has been bent to form a cylinder, the end rings 10 and 11 are first suitably positioned at either end of the cylinder so that they will receive the outwardly extending tabs 18. The tabs and edge portions of the end rings 10 and 11 are then subjected to high rolling pressure or if preferred, an impacting operation for the purpose of upsetting this projecting metal so that the tabs will be curved to conform to the inner surface of the end rims 10 and 11 and may be additionally secured if desired therein by spot welding or other suitable means.

The unit thus forms a cylindrical cake, open at both ends and mounted in driving connection with an axial drive shaft (not shown) by means of the driving disk 13. The driving disk comprises a pair of annular members 24 and 25 whose diameter is somewhat less than the inner periphery of the blades 12 and greater than the inner peripheral diameter between the protruding lugs 20. Each disk is pressed from heavy gauge sheet metal and has its outer peripheral edge portions 24a and 25a respectively bent in a plane substantially perpendicular to the plane of the disk. The central area of each disk contains a depressed or dished portion 24b, 25b, which adds to the structural rigidity of the disk members. Each disk member also includes a hub 27 provided with a set screw 29 and shaft aperture 30. Each hub is secured to the disk by a flange 27a which extends through an aperture, contained in the associated disk member, and which is spun or upset on the opposite side of said disk member so that the hubs are securely positioned in axial alignment in the driving disk 13. The hub thus provides a support for receiving a drive shaft and set screws 29 provide suitable fastening means for securing the disk to the shaft in proper working relation.

Referring now to the manner of bringing the several major elements into operative relation, it will be understood that the driving disk members have been annularly shaped, as seen in Figs. 2 and 3, by jig or special tool for this purpose (not shown). Each driving disk member is held in a plane at right angles to the axis of rotation of the blower wheel, one at each end of the blower, and then inserted axially into the blower wheel until the upturned peripheral edge portions of the disks are in contact with the side edges of the protruding lugs 20. With the parts in the relative positions, as seen in Fig. 2, it will be seen that the upturned peripheral edges of the disk members abut the outer edges 20a of the lugs 20. The disk members never actually contact each other and are kept apart a distance equal to the width of the lugs 20. Referring to Fig. 3 it will be seen that the protruding lugs 20 are in engagement with the disk member

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at equally spaced intervals about the entire circumference of said annular members.

To maintain the assembly, positioned as seen in Fig. 2, it becomes necessary to weld the respective disk members 24 and 25 to the lugs 20. In order to carry out the desired welding operation, the entire assembly of parts is positioned between a pair of electrodes (not herein shown). For example, an electrode may consist of a press welder having two opposed jaws which press the respective disk members toward one another in the direction of the arrows of Fig. 2 and into engagement with the protruding lugs 20. The other electrode may be connected to the blades of the centrifugal blower. In operation, the press welder is actuated to apply pressure to the assembled disk parts and electric current is supplied through the electrodes in sufficient intensity to produce high current density in the small areas of contact between the peripheral edge 24a and 25a respectively of the disk members and the protruding lugs 20. As the current pulsates through the abutting areas, sufficient welding heat is thus generated and the abutting parts caused to soften and cut into each other in telescoping relation (see Figs. 2 and 5) by the press welder and thereby become fused together to form the desired autogenous weld. The disk members 24 and 25 are thereby intimately merged with the lugs 20 and form an integral structure as to hold the driving disks in non-slipping, driving relationship with the blades 12.

It will now clearly appear that the present structure will result in great strength and rigidity in the finished wheel, since each of the two disks comprising the driving disk member reinforces the other, and together they support the blower body in such a manner that inward radial deformation is resisted. Outward displacement of the center part of the blower body is also prevented by the autogenous weld between the abutting surfaces of the disk and lug members.

Referring now to Figs. 6 and 7, I have illustrated another embodiment of the present invention. The blower wheel, herein illustrated is identical to that embodiment shown in Figs. 1 through 5, differing only in the specific means of mounting the driving disk. The blower wheel 40 comprises a pair of spaced end rims 41 and 42 which support a multiplicity of elongated blades 43 circumferentially arranged about a central axis.

The cylindrical body portion of the blower wheel, which includes the blades and the means by which they are carried, is developed from a single rectangular strip (not herein shown) of sheet material, as heretofore described with respect to Fig. 4. As previously described, the rectangular sheet is imperforate in the zone just beyond the ends of the blades providing lateral margins 44 having outwardly extending tabs 45 which are curved along with a portion of the lateral margin to conform to the inner radial surface of the end rims 41 and 42 and secured therein by spot welding or other suitable means. Each blade 43 is provided intermediate its ends with a pair of spaced slits 46 and 47 which extend inwardly from one edge of the blades to form tongues 48. The tongues are pressed out of the plane of the blade, as seen in Fig. 7, and are so constructed that their free ends do not protrude radially inwardly beyond the edge of the blades 43. Each of the blades 43 is bent out of the plane of the lateral margins 44 so that it will extend radially inwardly toward the central axis of the blower wheel after which the blades are shaped to form a cylinder contained within the end rims 41 and 42. The assembly of the central cylindrical blade portion and end rims 41 and 42 to form the blower wheel is identical to that previously described.

The central driving member comprises a pair of annular disk members 50 and 51 whose diameter is somewhat less than the inner diameter of the end rims 41 and 42. Each annular member is provided with a plurality of radially extending teeth 53 equalling in number

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the blades 43. The radially extending teeth are separated from one another by a space 54 having a width at least as great as the thickness of each blade 43. The teeth 53 have a circumferential width which is no greater than the spacing between adjacent blades 43. The diameter of the disk formed by the outer periphery of the teeth 53 is greater than the diameter formed by the inner periphery of the blades 43. The space 54 provided between the teeth 53 extends radially into each annular member 50 and 51, a sufficient amount so that its innermost edges form a diameter which is less than that formed by the inner periphery of the blades 43. Each annular disk is pressed from heavy gauge sheet metal and the outer peripheral edges of the teeth 53 are bent in a plane substantially perpendicular to the plane of the disk as seen at 56 in Fig. 6. The central area of each annular disk also contains a depressed or disk portion and a hub 58 in the identical manner as shown and described in Fig. 2.

The manner of bringing the several major elements into operative relation will now be described. Each annular disk member is held in a plane at right angles to the axis of rotation of the blower wheel, one at each end of the blower, so that the spaces 54 are in alignment with the edges of the blades 43, as seen in Fig. 7. The disks are then inserted axially into the blower wheel until the upturned peripheral edge portions of the teeth 53 are in contact with the side edges of the upstruck tongues 48. With the parts in these relative positions, it will be seen that the innermost peripheral edges of the blade 43 extend into the spaces 54 between the respective teeth 53 while the upturned peripheral edges of the teeth about the side edges of the tongues 48. The annular disk members actually never contact each other and are kept apart a distance equal to the width of the tongues 48. The tongues 48 are in engagement with the annular disk members at equally spaced intervals about the entire circumference of said annular disk members, as best seen in Fig. 7. The abutting portions of teeth 53 and the tongues 48 are then fused together to form a desired autogenous weld, in the same manner as heretofore described.

In view of the foregoing description, taken in conjunction with the accompanying drawings, it is believed that a clear understanding of the construction, operation and advantages of the device will be quite apparent to those skilled in this art.

It is to be understood, however, that even though there is herein shown and described a preferred embodiment of the invention, the same is susceptible to certain changes fully comprehended by the spirit of the invention.

What I claim is:

1. A centrifugal blower comprising a plurality of spaced blades circumferentially arranged to form a wheel open at at least one end for air inlet purposes, said blades being turned radially inwardly, the inner edge of said blades being provided with protruding lugs cut out of the edge of the adjacent blade, a driving disk comprising a pair of annular members, the outer peripheral edges of said annular members being in engagement with said lugs at equally spaced intervals about the circumference of said annular members, portions of said disks and lugs being intimately merged together to form an integral structure.

2. A centrifugal blower comprising a sheet metal cylindrical body element apertured and formed to provide a plurality of spaced blades generally parallel to a central axis and circumferentially arranged to form a wheel open at both ends for air inlet purposes, said blades being turned radially inwardly, the inner edge of each blade provided with an integrally formed protruding lug cut out of the edge of the adjacent blade, a driving disk comprising a pair of annular members, the peripheral edges of said annular members being in engagement with said lugs at spaced intervals about the circumference of said

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annular members, engaging portions of said disks and lugs being intimately merged together to form an integral structure.

3. A centrifugal blower comprising a plurality of spaced blades generally parallel to a central axis and circumferentially arranged to form a wheel open at at least one end for air inlet purposes, said blades being turned radially inwardly, the inner edge of at least some of said blades being provided with an integrally formed protruding lug cut out intermediate its ends from the edge of the adjacent blade, a driving disk comprising a pair of non-engaging generally parallel annular members, the outer peripheral edges of said annular members being curved axially inwardly toward each other, said peripheral outer edge portions of said annular members being in engagement with said lugs at spaced intervals about the entire circumference of said annular members, and interlocked portions of said disks and lugs being fused together to form an integral structure.

4. A centrifugal blower comprising a plurality of spaced blades generally parallel to a central axis and circumferentially arranged to form a wheel open at at least one end for air inlet purposes, said blades being turned radially inwardly, the inner edge of at least some of said blades being provided with a lug extending away from the leading edge of the associated blade, said lugs being located on a diameter greater than the diameter between the inner edges of said blades, a driving disk comprising a pair of generally parallel annular members,

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said annular members having radially outwardly extending teeth spaced from each other farther than the thickness of a blade, said teeth extending to a zone axially opposite said lugs and there engaging and welded to said lugs.

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