Feb. 28, 1967 L. COOK 3,306,527

CENTRIFUGAL BLOWER AND MOUNTING MEANS THEREFOR

Filed Aug. 27, 1964 2 Sheets-Sheet 1

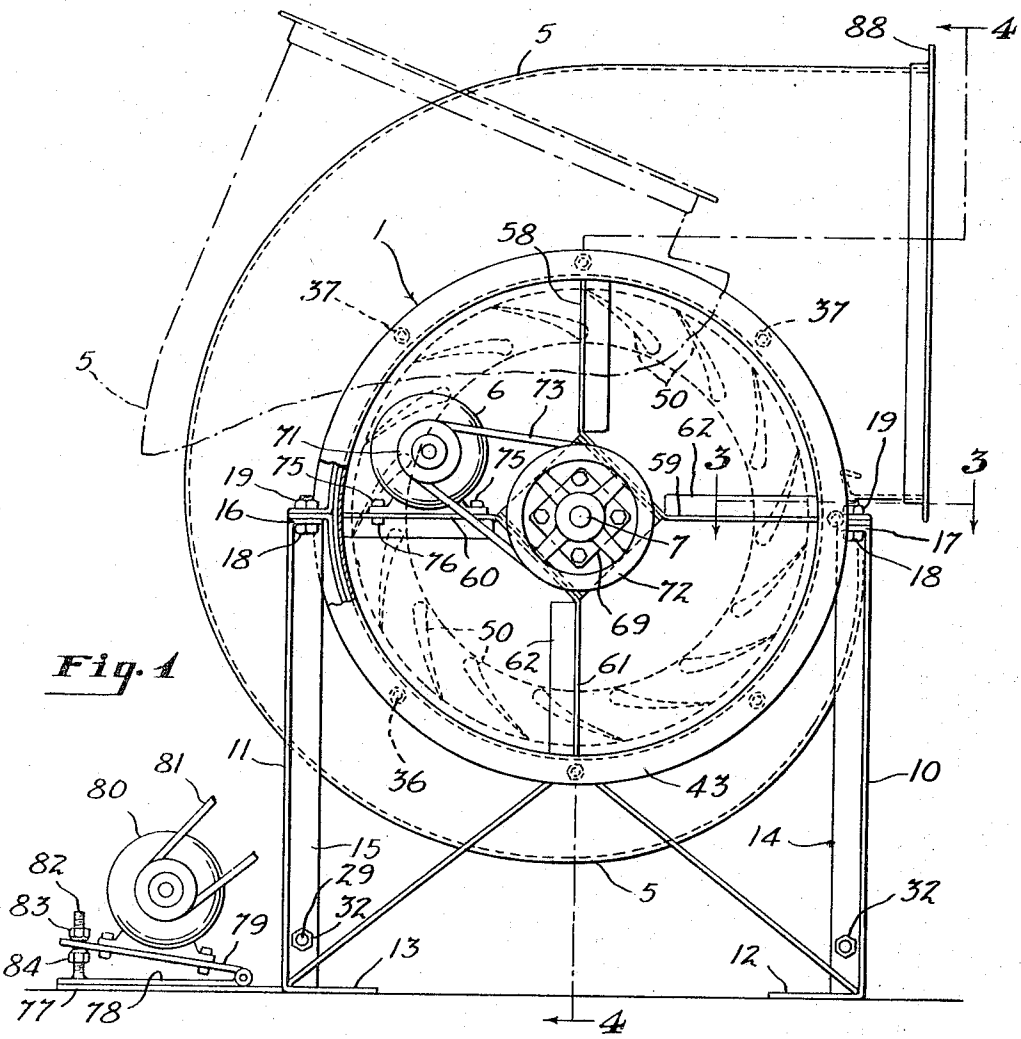


Fig. 1

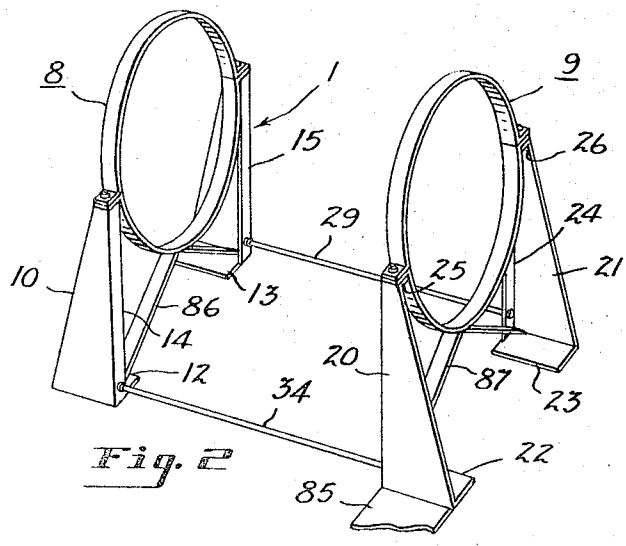


Fig. 2

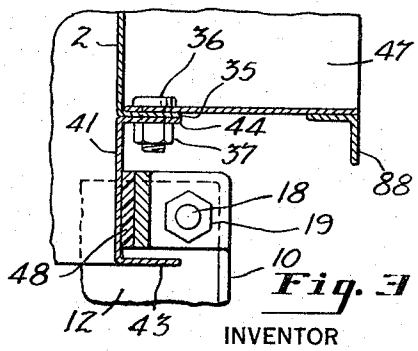


Fig. 3

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CENTRIFUGAL BLOWER AND MOUNTING MEANS THEREFOR

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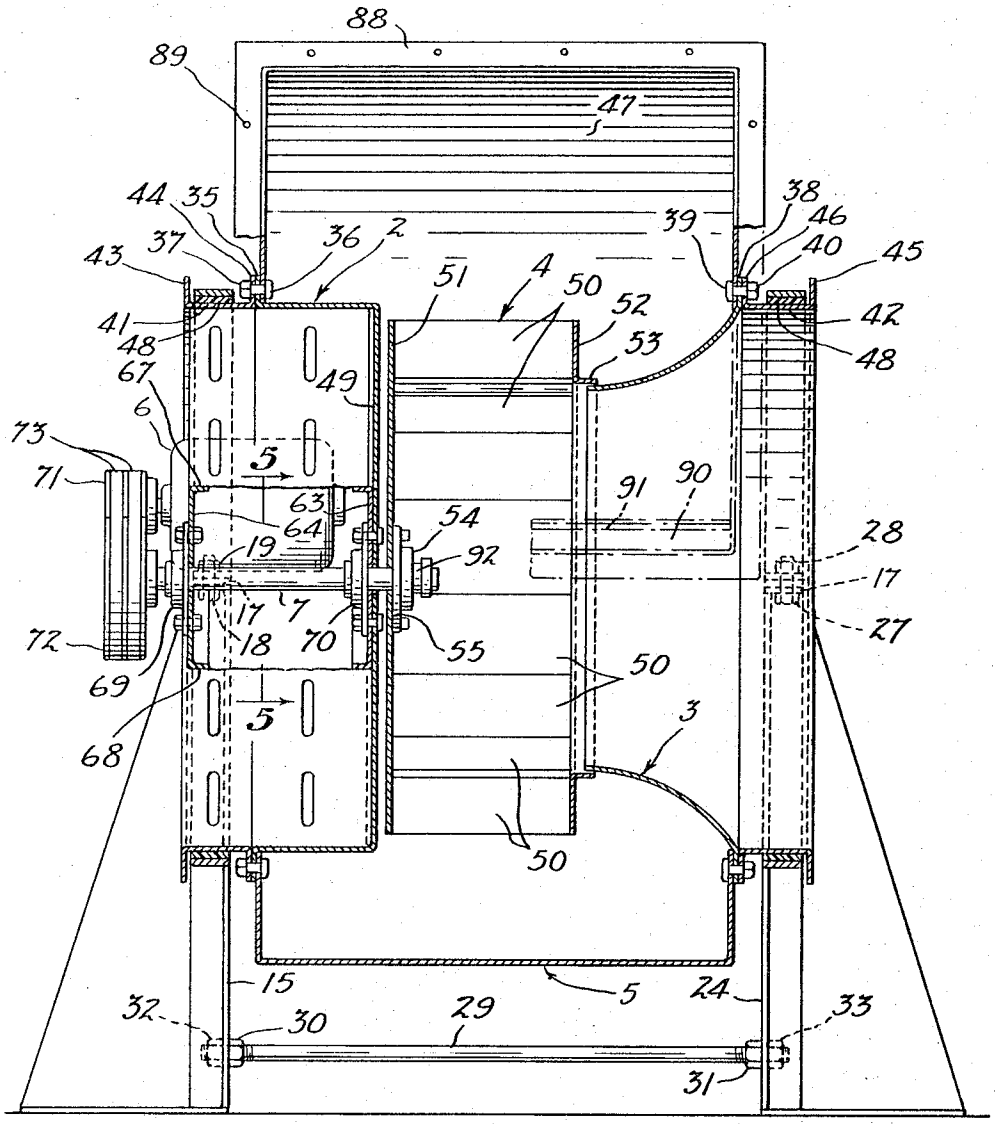


Fig. 4

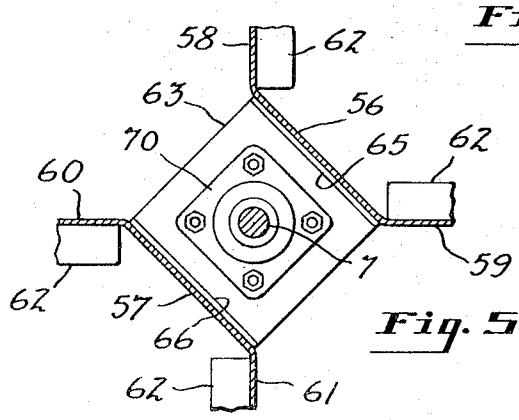


Fig. 5

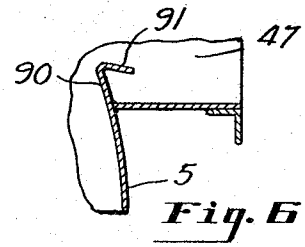


Fig. 6

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CENTRIFUGAL BLOWER AND MOUNTING MEANS THEREFOR

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Filed Aug. 27, 1964, Ser. No. 392,577
12 Claims. (Cl. 230—127)

My invention relates to a centrifugal blower which is compact in design and which may be easily installed on a floor, wall, ceiling, or roof of a building. It also relates to a support or mounting means for the blower having parts within which the blower is rotatable to a desired position and in which means associated with the mounting means and the blower are provided for setting the blower at the desired position.

At the present time, blower manufacturers have adapted a standard blower which may be set in sixteen different positions to provide sixteen different discharge positions which are pre-positioned at the factory before shipment.

According to my invention, I have provided an improved system including a blower which may be rotated to and set at a desired position so that the outlet or discharge opening of the blower may be lined up with any existing duct work without an additional part or discharge cowl. I have also provided an improved mounting for the blower having parts which may be removably connected together and which when set in a definite position is adapted to be installed on a floor, wall, ceiling, or roof of a building. In my improved system, when parts of the mounting means are removed from each other, the blower may be easily removed from the mounting means and when the blower is removed from the mounting means, the rotor or centrifugal wheel may also be easily removed from the blower. The parts of the blower may therefore be easily serviced or repaired.

My improved blower also includes a cylindrical casing extending into the scroll which forms a compartment in which the power-operating means may be mounted. This arrangement not only provides a compact assembly but permits easy access to the power-operating means for servicing and lubrication. The static and velocity pressure properties of my improved blower, however, are not affected by the volume of the motor casing because this is taken into consideration with respect to the volume and area proportions of the interior housing of the scroll. In general, it may be stated that my improved blower includes a scroll, a motor casing, an inlet duct means, and a rotor, all of which are preferably constructed of aluminum to provide a structure that is light in weight and which is substantially free from corrosion problems.

It is therefore an object of the present invention to provide a system including a centrifugal blower and mounting means for supporting the blower and in which means associated with the mounting means and the blower are provided which permits rotation of the blower relative to the mounting means and by means of which the blower may be set at such a position that its outlet means may be lined up with existing duct means without an additional part or discharge cowl.

Another object of my invention is to provide a compact blower assembly which is light in weight and which is so constructed that the rotor or centrifugal wheel may be easily removed for servicing.

A further object of my invention is to provide a compact blower having a casing arranged within an opening in one side of the blower which forms a compartment for power-operating means which is therefore easily accessible for servicing and lubrication.

A still further object of my invention is to provide an improved mounting means for supporting a blower upon any desired surface, such as a floor, wall, ceiling or roof.

Other objects and advantages of my invention will be apparent as the specification proceeds.

My invention will be better understood by reference to the accompanying drawings in which:

FIG. 1 is an end view of my improved blower showing it mounted within split ring supports;

FIG. 2 is a perspective view of the mounting means;

FIG. 3 is a detail view taken on a plane passing through the line 3—3 of FIG. 1, looking in the direction of the arrows;

FIG. 4 is a cross sectional view taken on a plane passing through the line 4—4 of FIG. 1 with parts shown in elevation;

FIG. 5 is a cross sectional view taken on a plane passing through the line 5—5 of FIG. 4 with parts shown broken away; and

FIG. 6 is an enlarged detail sectional view of an elongated lip on that portion of the scroll adjacent one edge of its discharge opening.

As shown in the drawings, my improved system includes a support or mounting means designated generally by the numeral 1, a cylindrical casing 2, an air inlet duct means 3, a rotor or centrifugal wheel 4, a scroll 5, and power-operated means for driving the rotor or centrifugal wheel including a motor 6 and a drive shaft 7.

As shown in the drawings, the mounting means includes a pair of split rings 8 and 9 and means for supporting each of the split rings and for removably securing the supporting means for the split rings together. For supporting split ring 8, a pair of spaced standards 10 and 11 are provided which are arranged on the opposite sides of ring 8, each of which has a comparatively large inwardly extending base portion 12 and 13, respectively, an inwardly extending strengthening flange 14 and 15, respectively, and the outer edge of each of which standards tapers upwardly to substantially the dividing plane between the upper and lower portions of ring 8 and terminates in an inwardly extending flange 16 and 17, respectively, as shown in FIG. 2 upon which outwardly extending mating flanges on each side of the upper and lower portions of the split ring 8 rest and which are connected thereto by bolts 18 having nuts 19 threaded thereon as shown more particularly in FIG. 1.

Split ring 9 is supported in a similar manner. As shown, a pair of spaced standards 20 and 21 are provided, each of which has an inwardly extending base portion 22 and 23, respectively, and strengthening flanges 24, only one of which is shown. The outer edges of standards 20 and 21 taper upwardly and terminate in inwardly extending flanges 25 and 26 upon which outwardly extending mating flanges of the upper and lower portions of split ring 9 rest and which are connected thereto by bolts 27 having nuts 28 thereon as shown in FIG. 4.

Means are also provided at the lower portions of the standards for removably connecting standards 10 and 20 and standards 11 and 21 together. As shown more particularly in FIGS. 2 and 4, a rod 29 is provided which extends through apertures in flanges 15 and 24 of standards 11 and 21, the opposite ends of which rods is threaded and inner nuts 30 and 31 engage the inner faces of flanges 15 and 24 and outer nuts 32 and 33 engage the outer faces of flanges 15 and 24. In a like manner, a similar connecting rod 34 is removably connected to flange 14 of standard 10 and the strengthening flange on standard 20 which corresponds to flange 24 on standard 21. It will of course be understood that the connecting rods are preferably arranged at a sufficiently low level to permit the scroll to be at least partly rotated between the rings of the mounting means although it will of course be under-

stood that one of the connecting rods may be removed for this purpose.

As shown in FIG. 4, the scroll 5 is provided with openings at its opposite sides, the opening at the left hand side of the scroll as shown in FIG. 4 being closed by motor casing 2 which has an outwardly extending annular flange 35, see FIG. 3, secured to the edge of the scroll at the left hand opening by suitable means, such as bolts 36 having nuts 37 thereon and the opening at the right hand side of the scroll as shown in FIG. 4 is closed by the venturi-shaped inlet duct means 3 which has an outwardly extending annular flange 38 which is connected to the edge of the scroll adjacent thereto by suitable means, such as bolts 39 having nuts 40 thereon. It will of course be understood that if it is more convenient for mounting purposes, the motor casing may be secured to the scroll at the edge of the opening at the right hand side of the scroll as shown in FIG. 4 in which case the inlet duct means is secured to the edge of the opening at the left hand side of the scroll. In such case, the rotor 4 is also reversed.

Means associated with the blower are also provided by means of which it may be mounted within the split rings 8 and 9. For this purpose, a pair of rings 41 and 42 are provided, ring 41 having an outer annular flange 43 and an inner annular flange 44 which is held in place on the edge of the scroll adjacent flange 36 of the motor casing by the bolts 36. In a like manner, ring 42 terminates in an outer annular flange 45 and is provided with an inner annular flange 46 which is held in place on the edge of the scroll adjacent flange 38 by bolts 39.

When bolts 18 and 27 and nuts 19 and 28 which hold the split rings of the mounting support in place are removed, the upper parts of the split rings 8 and 9 may be removed and rings 41 and 42 may be supported on the lower portions of the split rings. The upper portions of rings 8 and 9 may then be replaced at which time bolts 18 and 27 may be inserted through the openings in the flanges on the adjacent standards and the split rings and their nuts 19 and 28, respectively, are adjusted sufficiently to hold the rings in place but are loose enough to permit the rings on the blower and the blower to be rotated relative to the mounting means. When the blower has been rotated to a sufficient extent to move the discharge opening 47 of the scroll to the desired position to be connected to an inlet or outlet duct means in a wall, roof, ceiling or floor, the nuts on bolts 18 and 27 may be tightened to hold the scroll of the blower in its set position. By loosening the nuts on the bolts and rotating the blower and then tightening nuts 19 and 28 on the bolts, it will of course be apparent that the discharge opening in the scroll may be set in any desired position. To isolate vibrations, a ring 48 may be provided which may be formed of a suitable plastic material, such as a synthetic rubber. Neoprene has been found satisfactory. Ring 48 also aids in holding the blower in place after it has been set at the desired position. The blower may be mounted in place on a floor, ceiling, side wall, or roof, of a building by passing fastening means, such as screws or bolts, through the base flanges 12, 13, 22 and 23 of the mounting means and forcing them into the supporting surface.

Between the bottom wall 49 of casing 2 and the inlet duct means 3 is the rotor or centrifugal wheel 4 which consists of a plurality of blades 50 secured to and arranged between back plate 51 and an inlet ring 52 which inlet ring has an outwardly extending flange 53 thereon which as shown is rotatable in close tolerance around the outer periphery of duct means 3. The blades in the rotor or centrifugal wheel may be of a backward curved true airfoil type. For driving the rotor the shaft 7 is provided with a hub 54 having an outwardly extending flange 55 to which plate 51 is secured by suitable means, such as rivets.

The rotor 4 may be driven directly by the motor 6 in which case the motor may be mounted upon the outer side of plate 49 with its shaft extending through an opening in the plate in which case the hub 54 is mounted on the motor shaft. As shown, however, shaft 7 is driven indirectly by motor 6 and means are provided for mounting shaft 7 and motor 6 in place within or at least partly within the motor casing to provide a compact assembly. For this purpose, a pair of similar angularly extending plates 56 and 57 are provided as shown in FIGS. 1 and 5, plate 56 terminating in a vertically extending leg 58 as shown in FIG. 1 and a horizontally extending leg 59, and plate 57 terminating in a horizontally extending leg 60 which is arranged in alignment with leg 59 and a vertically extending leg 61 which is arranged in alignment with leg 58. It will of course be understood that the legs will assume different positions as the blower is rotated within the rings 8 and 9. As shown, each leg is provided with a flange 62 which may be secured to the bottom plate 49 of casing 2 in any suitable manner, such as by welding.

To provide a support for shaft 7, spaced inner and outer plates 63 and 64 are provided, each of which has a centrally disposed aperture therein to receive shaft 7. As shown, inner plate 63 is provided with oppositely disposed outwardly extending flanges 65 and 66 which may be welded or otherwise secured to plate 56 and 57, respectively, and plate 64 is provided with oppositely disposed inwardly extending flanges 67 and 68 which may be secured to plates 56 and 57 in a similar manner.

Suitable bearings are provided between shaft 7 and the apertures in the plates or cross pieces 63 and 64 and while, if desired, sleeve bearings may be used, as shown, the outer races of two sets of ball bearings 69 and 70 are secured to the respective plates 63 and 64 by suitable means, such as bolts, and the inner race of each of the bearings is secured to shaft 7 by similar means.

The motor 6 for driving shaft 7 may be adjustably supported on any one of the legs 58, 59, 60 or 61. Preferably, however, it is supported on that leg which is in a horizontal position when the blower is adjusted to the position in which the discharge opening of the scroll is in engagement with the desired inlet or outlet duct means. As shown in the drawings, motor 6 is supported on leg 60 and has a pulley 71 secured to its shaft in the usual manner, such as by a key or spline, or a key or spline in combination with rivets. Shaft 7 is also provided with a pulley 72 which is secured thereto in a similar manner and which is arranged in alignment with pulley 71 on the motor shaft and suitable means, such as one or more belts 73, are trained around the grooves in the pulleys on the motor shaft and the drive shaft 7. To enable the belts to be maintained at the desired tightness, each leg of plates 56 and 57 is provided with elongated slots 74 through which bolts 75 passing through the base of the motor extend which are held in place by nuts 76. To tighten the belt, nuts 76 are loosened and the motor is moved outwardly relative to the drive shaft and to loosen the belt, the nuts are loosened and the motor is moved inwardly relative to the drive shaft. In either case, after the motor is moved to the desired position, the nuts are again tightened to hold the motor in place.

While the motor is preferably arranged within the casing 2, it will of course be understood that if desired it may be supported on the mounting means and this is particularly true if the blower and motor are large. For instance, one of the standards may be provided with an outwardly extending flange 77 upon which a motor-supporting bracket is mounted. As shown, the bracket consists of a stationary arm 78 which may be secured to flange 77 by suitable means, such as rivets. The bracket also consists of a movable arm 79 which is pivotally secured at one end to the stationary arm 78 and to which the motor 80 is secured by suitable means, such as bolts, and means are provided for adjusting the position of the motor to loosen

or tighten belt **81**. It will of course be understood that when motor **80** is used, a belt **81** is provided which is trained around pulley **72** on the drive shaft. For this purpose, a stud **82** connected to the stationary arm **78** passes through an aperture in the free end of arm **79** and spaced nuts **83** and **84** threaded on stud **82** on opposite sides of arm **79** are provided. To tighten belt **81**, nuts **83** and **84** are threaded downwardly on stud **82** and to loosen the belt, they are threaded upwardly. In the event that the motor casing extends through the opposite end of the blower, a flange **85**, parts of which are broken away, may be connected to either standard **20** or standard **21** to support the motor.

For supporting the split rings, a V-shaped brace **86** is provided at one end, the opposite ends of which are secured to the lower portions of standards **10** and **11** and in like manner a V-shaped brace **87** is provided for supporting split ring **9**, the opposite ends of which are welded or otherwise secured to the lower portions of standards **20** and **21**.

To enable the discharge outlet of the scroll to be connected to existing duct means, its discharge portion is provided with an outwardly extending flange **88** which may be formed integral therewith or welded or otherwise secured thereto as shown in FIG. 3 and which is provided with openings **89** through which bolts may be inserted to connect the scroll to existing duct means.

Means are also provided to permit pressure to be built up within the scroll as the blades approach the lower portion of the discharge opening of the scroll. For this purpose, an angularly-shaped member **90** extending across the lower portion of the outlet opening of the scroll is provided, the upper portion of which is arranged at an angle of approximately 15° from a plane passing through the center of the inlet opening and the angularly-shaped member and which terminates in a flange **91** which is bent downwardly at an angle of approximately 17° to a plane passing through its upper end to facilitate the outflow of air through the discharge opening.

To remove the blower from its mounting, it is only necessary to remove the upper portions of the split rings and raise the blower assembly. After the blower assembly has been removed from its support or mounting, the nuts **40** of bolts **39** may be removed and ring **42** and inlet duct means **3** may be drawn outwardly from the housing. A tool may then be inserted in a slot **92** in hub **54** to remove the rotor which if desired may be replaced with a rotor of any suitable type, such as a backwardly curved mean airfoil rotor or centrifugal wheel. Such rotors have capacities ranging from 100 cubic feet to 30,000 cubic feet per minute and have a static pressure from zero to three and one-half inches of water. A backward curved true airfoil rotor or centrifugal wheel as shown has capacities ranging from 100 cubic feet to 40,000 cubic feet per minute and a still higher static pressure than the backward curved mean air foil rotor.

What is claimed is:

1. A system including a blower having an air inlet means and a discharge outlet, mounting means for said blower including a pair of rings, each having upper and lower separable parts, means for releasably securing the parts of each of said rings together, means for supporting said rings, and annular means associated with each end of said blower which may be positioned within the lower parts of said rings when the upper parts of the rings are removed, said annular means being held in position when the upper parts of said rings are positioned over said annular means and said securing means is set to hold the annular means within the rings, said blower being rotatable when the upper rings of the mounting means are loosely secured to the lower rings and said securing means being adjustable to a position in which said rings engage said annular means with sufficient force to prevent rotation of said blower relative to said rings, thereby enabling its air discharge means to be set in any desired position.

2. A blower including a scroll having an inlet opening and a discharge opening, an inlet duct means leading into the blower and having a peripheral flange releasably secured to the outer edge of the scroll adjacent the inlet opening, a rotor arranged within said blower including a back plate, an inlet ring spaced from said plate, and blades arranged between and secured to said plate and ring, means for driving said rotor including a drive shaft having a hub secured to the back plate of said rotor which hub has a recess at its inner end portion between said plate and said ring, mounting means for said blower including a pair of split rings, each having lower and upper parts, and releasable means for securing said rings together, said blower being removable from said mounting means when the upper part of each pair of rings is released, said inlet duct means being removable from the blower when the upper part of each of the split rings is removed, and said rotor being removable from said scroll when a tool secured in the recess of said hub is pulled outwardly to remove the hub from the drive shaft and the rotor outwardly through said inlet opening.

3. The combination of a blower having outwardly extending rings, mounting means for said blower including a pair of rings, each having upper and lower portions, adjusting means for securing the upper and lower portions of each of the rings of said mounting means together, and the lower portion of each of said mounting rings being of sufficient size to enclose the lower portion of the ring at each end of the blower and to hold it in such position that the blower may be rotated within the rings when the adjusting means between the upper and lower portions of both of said mounting rings are loosely applied and to set said blower against rotation when said adjusting means between the upper and lower portions of the mounting rings are tightly applied, and means for supporting said mounting rings at sufficient height so that said blower may be rotated to any desired position.

4. The combination as defined in claim **3** in which the supporting means for each ring consists of a pair of standards and in which releasable means is provided for connecting the standards at the opposite ends of the mounting means together.

5. The combination as defined in claim **3** including a second ring formed of a plastic material extending around the outer periphery of the ring extending outwardly from each end of the blower to isolate vibrations which second ring also aids in holding the blower in its set position when the adjustments between the upper and lower portions of the mounting means are tightly applied.

6. The combination as defined in claim **5** in which the ring for isolating vibrations is formed of synthetic rubber.

7. A blower including a scroll having a discharge opening and a pair of oppositely disposed side openings, an annular inlet duct means secured to the edge of the scroll adjacent one edge opening and extending a substantial distance into the scroll, power-supporting means including a substantially cylindrical casing having a portion secured to the scroll against the edge of the other side opening and terminating in a substantially flat bottom wall extending to its outer cylindrical portion, a rotor including a back plate which is substantially parallel to the bottom wall of said casing and which is spaced axially inwardly therefrom and which has substantially the same diameter as the bottom wall of the cylindrical casing, and said rotor also including an inlet ring spaced from and being parallel to its back plate which is provided with an outwardly extending flange that is rotatable in close tolerance around the inner edge of the inlet duct means, blades arranged between and connected to said plate and ring, and means operatively associated with said power means for driving said rotor for drawing air into the scroll through said inlet opening and for discharging it from the scroll through its discharge opening.

8. Apparatus as defined in claim 7 in which the power means is a motor which is substantially enclosed within the cylindrical casing extending into the scroll.

9. Apparatus as defined in claim 8 in which a plurality of legs are secured to the bottom wall of the cylindrical casing and have outwardly extending flanges arranged within the casing upon one of which the motor is mounted.

10. Apparatus as defined in claim 9 in which a shaft having a pulley on its outer end extends through the cylindrical casing and the bottom wall thereof and is operatively connected to the back plate of the rotor, bearing means within the casing for supporting said shaft, and in which the shaft of the motor extends outwardly beyond the cylindrical casing and has a pulley connected thereto, a belt trained around said pulleys to provide an operative connection between said motor and said shaft, and means whereby said motor may be adjustably mounted on one of said legs to enable the tightness of the belt to be adjusted.

11. A blower including a scroll having a discharge opening and a pair of oppositely disposed side openings, an annular inlet duct means secured to the edge of the scroll adjacent to one side opening and extending a substantial distance into the scroll, power supporting means including a substantially cylindrical casing having a portion secured to the scroll adjacent to the edge of the other side opening and terminating in a substantially flat bottom wall, a rotor including a back plate which is substantially parallel to the bottom wall of the casing, said rotor also including an inlet ring spaced from its back plate which is provided with an outwardly extending flange which is rotatable in close tolerance around the inner edge of the inlet duct means, blades arranged between and connected to said plate and ring, means operatively associated with said motor for drawing air into the scroll through said inlet opening and for discharging it from the scroll through its discharge opening, and an angularly-shaped member integral with the scroll and extending across the lower portion of the outlet opening of the scroll, the upper portion of which is arranged at an angle of approximately 15° from a plane passing through the center of the inlet opening and the angularly-shaped member and which terminates in a flange which is inclined at an angle of approximately 17° to a plane passing through its upper end to facilitate the outward flow of air through the discharge opening.

12. A blower including a scroll having an inlet duct means extending therein, a peripheral flange secured to the outer edge of the scroll adjacent to the inlet opening, a rotor arranged within said scroll having a back plate, an inlet ring spaced from said back plate and blades arranged between and secured to said plate and said ring, means for driving said rotor including a drive shaft having a hub secured to the back plate, securing means arranged on said hub between said plate and said ring, releasable mounting means for said blower, said inlet duct means being removable from the scroll when the mounting means for the blower is released, and said rotor being removable from said scroll when a tool engaging said securing means is pulled outwardly to remove the hub from the drive shaft and the rotor outwardly through the inlet opening.

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