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Goettl

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[54] **CENTRIFUGAL BLOWER ASSEMBLY**

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[52] **U.S. Cl.** **415/201,** 416/178, 415/98, 417/423

[51] **Int. Cl.** **F04d 29/40,** F01d 3/00

[58] **Field of Search** ..... 415/201, 219; 416/178, 187; 220/5 R, 88 R, 89 B; 242/68.4, 129.51

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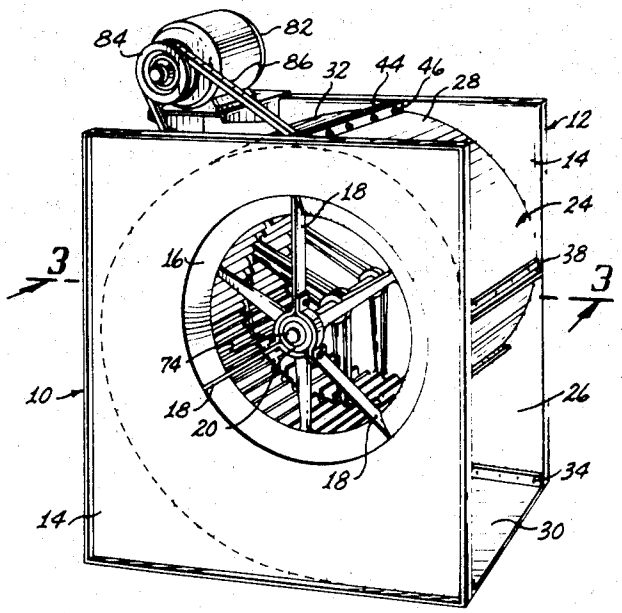
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[57] **ABSTRACT**

A pair of spaced apart axially slidable stub shafts upon which a rotor is supportingly mounted, and a removable segment of the spiral shaped surface of a centrifugal blower housing are provided for servicing and facilitating installation and removal of the rotor from the blower structure.

7 Claims, 7 Drawing Figures



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SHEET 1 OF 3

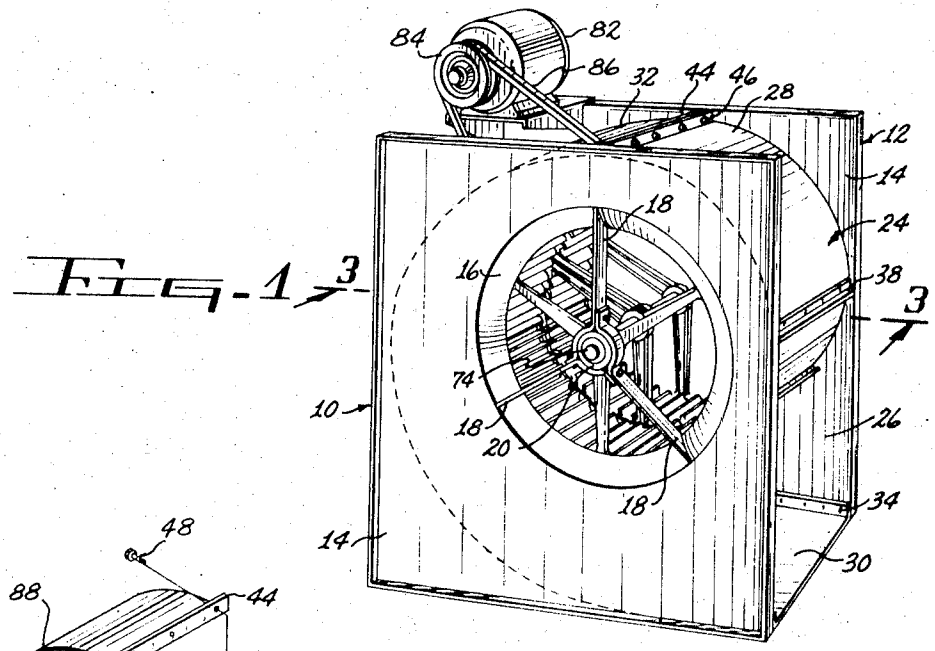


Fig-1

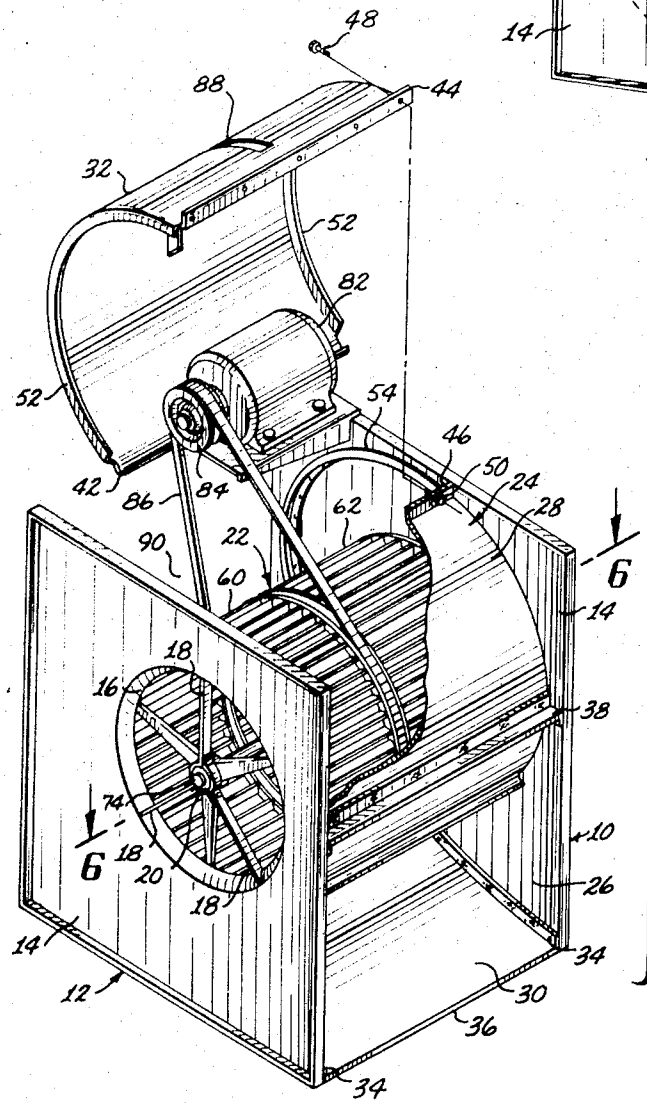


Fig-2

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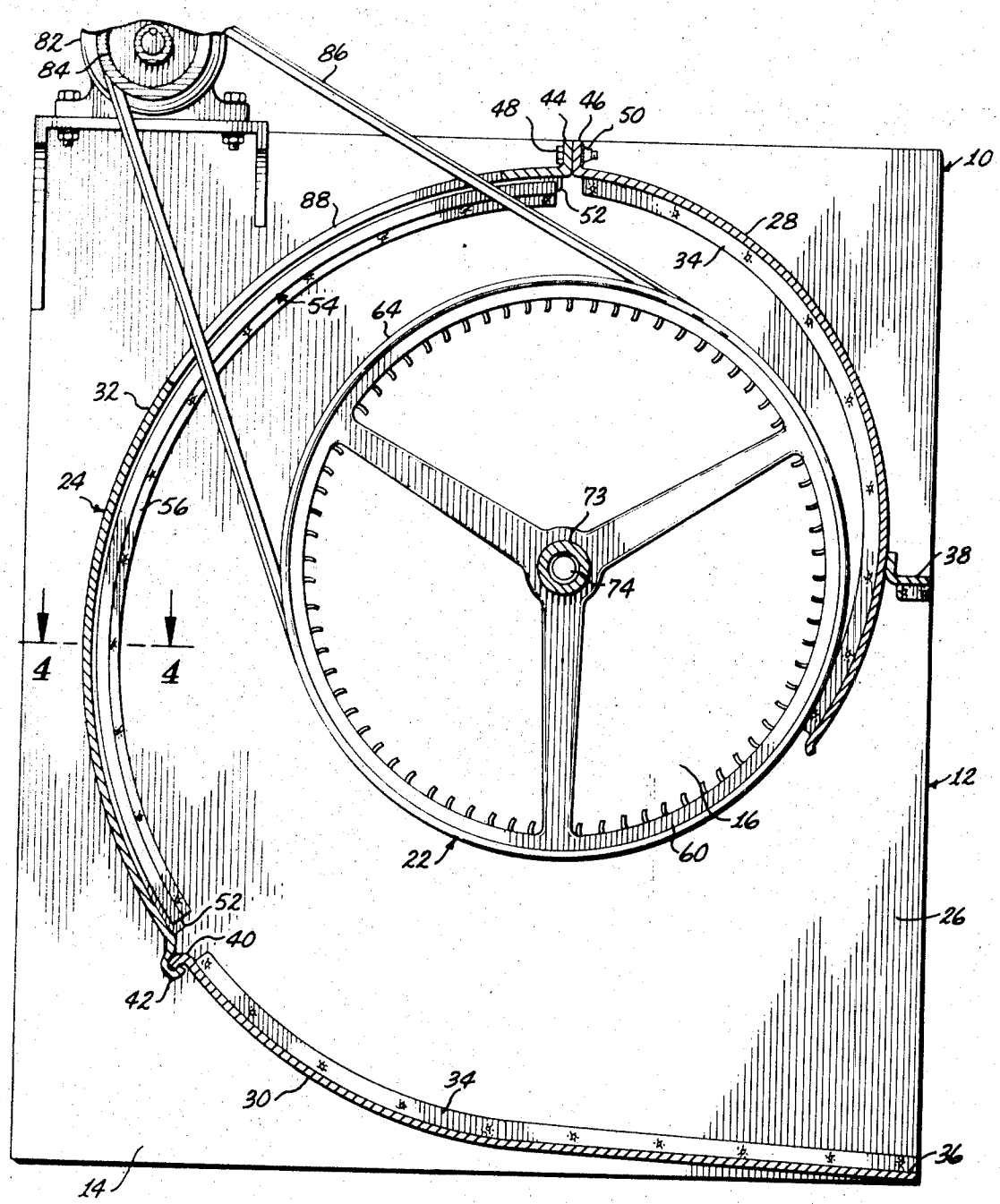


Fig-3

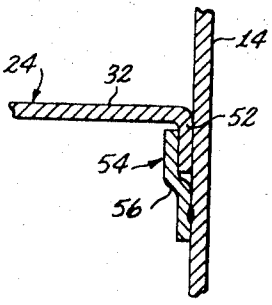


Fig-4

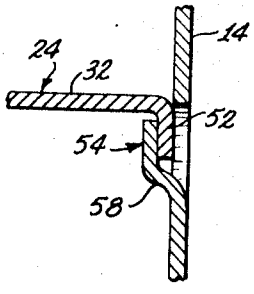


Fig-5

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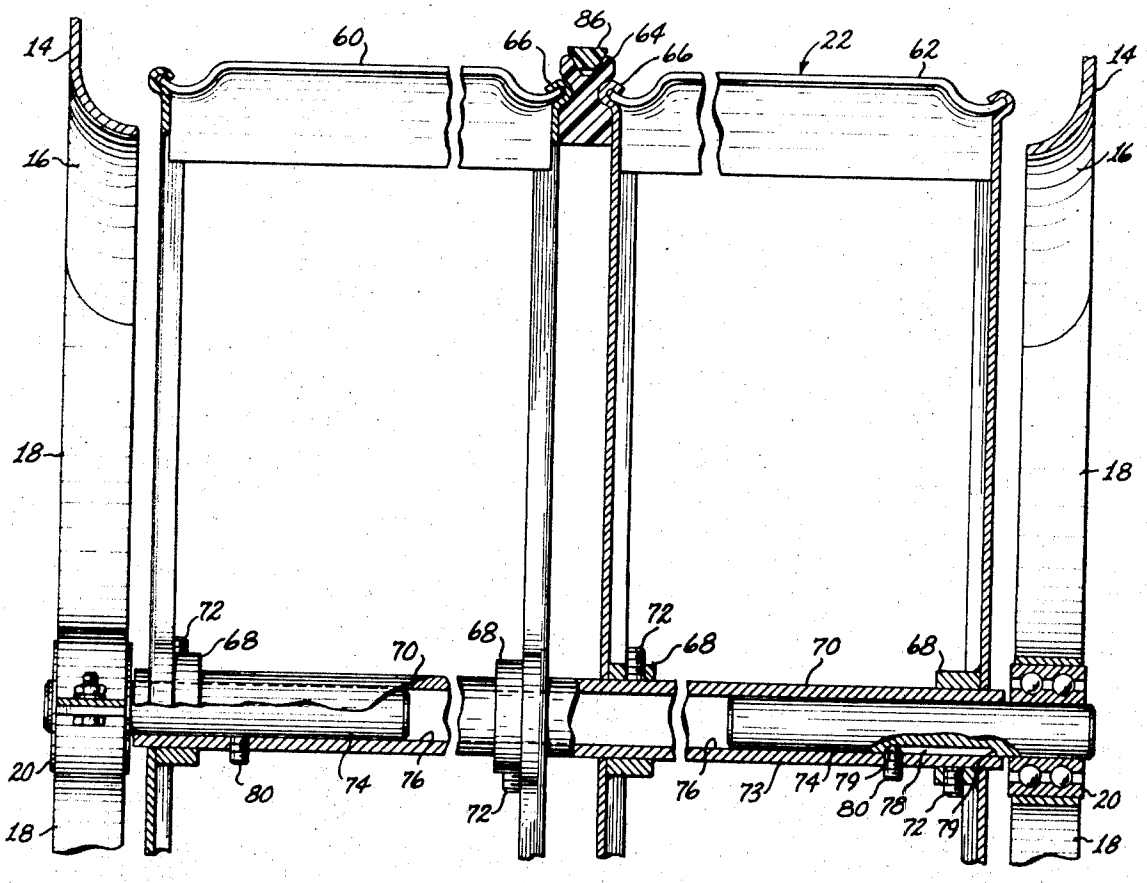


Fig. 6

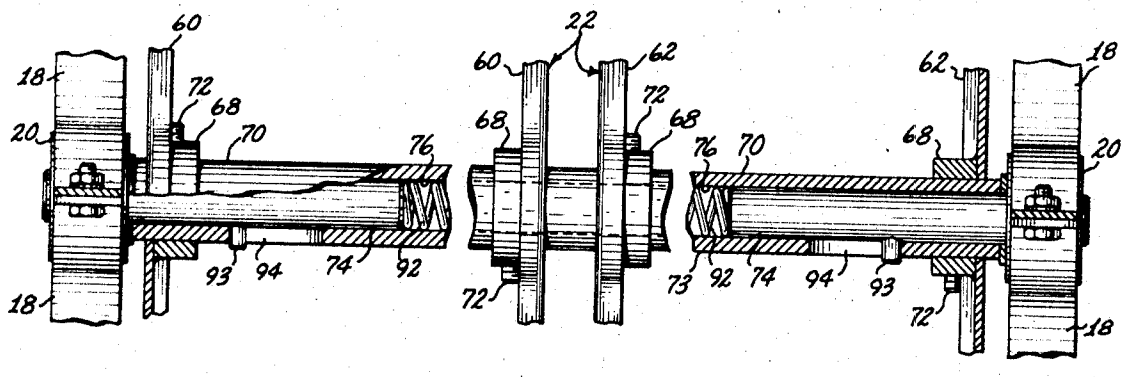


Fig. 7

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CENTRIFUGAL BLOWER ASSEMBLY

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to air handling equipment and more particularly to a centrifugal blower assembly.

2. Description of the Prior Art

In the field of air handling equipment, centrifugal blower assemblies have long been employed for such uses as ventilation, fume exhaust, material handling and the like. Blower assemblies have been designed in almost every conceivable size, volumetric output capacity and pressure range. Also, these blowers have been constructed in down-draft, up-draft and side-draft models with many angular variations thereof.

These centrifugal blower assemblies regardless of application and the above described variables are all provided with the same basic components and operate in the same basic manner.

In general the prior art centrifugal blowers comprise a spiral-shaped housing normally fabricated of sheet metal and welded into a one-piece structure. The housing is provided with an air inlet opening formed in at least one of the spaced apart side walls, and a centrifugal outlet through which exhaust air is expelled.

An air moving rotor or impeller is positioned within the housing for axial alignment with the inlet openings. The rotor is demountably carried on an axle shaft and is rotatably movable therewith. The ends of the axle shaft extend from the opposite ends of the hub of the rotor and are rotatably journaled in bearings located centrally within the inlet openings by suitable braces.

Rotation of the rotor may be accomplished by coupling a suitable power means to the axle shaft either by directly coupling a gear drive or a pulley belt arrangement. An alternate method of driving the rotor is to provide a belt driven pulley on the periphery of the rotor. Such a drive system is fully disclosed in a U.S. patent application by the same inventor entitled "A Rotor For a Blower Structure," Ser. No. 133,188 filed Apr. 12, 1971, now U.S. Pat. No. 3,702,741.

Optimum air handling characteristics dictate that the diameter of the air inlets be less than the diameter of the rotor. Due to this and the one-piece construction of the housing it should be readily apparent that installation and removal of the rotor can only be accomplished through the centrifugal outlet of the housing. Also, the length of the rotor axle necessitates that it be installed or removed by axially sliding it through one of the inlet openings.

Installation of centrifugal blow assemblies normally includes supportingly positioning the assembly adjacent to a horizontal or vertical structure such as the roof or wall of a building so that the centrifugal outlet may be connected to suitable duct work extending through the structure. To install or remove a rotor from a blower assembly installed in this fashion requires that the assembly be removed from its mounting structure to provide the necessary access to the centrifugal outlet.

In some instances access to the inlet openings of centrifugal blower assemblies may be restricted by adjacent structures or other devices such as vortex dampers, material supplying ducts, drive mechanisms and the like. Such restrictions hamper servicing of the rotor and its associated drive mechanisms. These restrictions along with dirt, rust and other contamination which may accumulate on the axle, also complicates removal of the axle when rotor removal is necessary.

In view of the foregoing a need exists for a new and useful centrifugal blower assembly which solves some of the problems associated with the prior art structures.

SUMMARY OF THE INVENTION

In accordance with the invention, a new and useful centrifugal blower assembly is disclosed which facilitates installation and removal of a rotor and servicing of its associated drive mechanisms.

The housing of the centrifugal blower assembly is provided with a removable segment of its spiral-shaped surface. This segment is demountably attached to the housing for covering an access opening through which the air moving rotor may be installed or removed. This covered access opening also provides access to the interior of the housing for servicing the rotor or its associated drive mechanism.

The rotor is mounted within the blower housing on a pair of stub shafts which are axially slidably carried in opposite ends of the tubular hub of the rotor. Each of the stub shafts are axially positionable within the rotor hub so that they may be axially extended for rotating engagement with suitable bearings. The stub shafts may be axially retracted into the rotor hub to disengage them from the bearings and thus facilitate removal of the rotor from the blower housing.

Accordingly, it is one object of the present invention to provide a new and useful centrifugal blower assembly.

Another object of the present invention is to provide a new and useful centrifugal blower assembly in which a covered access opening is provided in the spiral-shaped surface of the blower housing.

Another object of the present invention is to provide a new and useful centrifugal blower assembly in which a segment of the spiral-shaped surface of the blower housing is removable to provide means for installing or removing the rotor and for servicing purposes.

Another object of the present invention is to provide a new and useful centrifugal blower assembly in which the rotor axle comprises a pair of axially slidable stub shafts positioned in opposite ends of the tubular hub of the rotor.

Another object of the present invention is to provide a new and useful centrifugal blower assembly in which the rotor axle comprises a pair of axially slidable stub shafts which facilitate installation or removal of the rotor from the blower housing through an access opening provided when a demountable segment of the spiral-surface of the housing is removed.

The foregoing and other objects of this invention, the various features thereof, as well as the invention itself, may be more fully understood from the following description when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a centrifugal blower assembly incorporating the various features of the present invention;

FIG. 2 is a perspective view partially exploded to illustrate removal of a demountable segment of the spiral-shaped surface of the blower housing;

FIG. 3 is an enlarged sectional view taken on the line 3—3 of FIG. 1;

FIG. 4 is an enlarged fragmentary sectional view taken on the line 4—4 of FIG. 3;

FIG. 5 is a sectional view similar to FIG. 4 illustrating a modification thereof;

FIG. 6 is a fragmentary sectional view of the rotor illustrating the mounting of the rotor within the blower housing according to the principles of the present invention; and

FIG. 7 is a fragmentary sectional view similar to FIG. 6 illustrating a modification thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings, FIG. 1 illustrates one type of a centrifugal blower assembly which is indicated generally by the reference numeral **10.**

It should be understood that the blower assembly **10** as illustrated is not intended as a limitation to the present invention. The blower assembly **10** is shown as a side-draft model having other specific details of design which were chosen merely for illustrative purposes.

As seen best in FIGS. **1** and **2,** the centrifugal blower assembly **10** includes a housing **12** having a pair of vertically disposed spaced apart side walls **14.** Each of the side walls **14** is provided with an air inlet opening **16** formed therein. Each of the inlet openings **16** has a plurality of radial struts **18** the inner ends of which are formed to house suitable bearings **20.**

The bearings **20** as well as the inlet openings **16** are in alignment with each other and have an air moving rotor **22** rotatably journaled therebetween as will hereinafter be described in detail.

The housing **12** of the centrifugal blower assembly **10** further includes a spiral-shaped surface **24** which is positioned to extend between the side walls **14.** As is well known in the art, the spiral-shaped surface **24** cooperates with the inlets **16** and the rotor **22** to draw air into the assembly **10** through the inlets **16** and expel the air through a centrifugal outlet **26.**

The spiral-shaped surface **24** is fabricated in two fixedly mounted segments **28** and **30,** and a removable segment **32** as best seen in FIG. **3.**

The fixed segments **28** and **30** are each provided with flanges **34** on their side edges which are positioned to contiguously engage the side walls **14.** The flanges **34** are tack welded, or otherwise fixedly secured to the side walls **14,** and thus provide structural rigidity to the housing **12.**

The centrifugal outlet **26** is formed by the side walls **14,** an extending end **36** of fixed segment **30** and a horizontally disposed member **38.** The member **38** extends between the side walls **14** and is fixedly secured thereto, and is also attached on its inner end to the fixed segment **28.**

The fixed segment **30** is provided on its inner end with a hook **40** to which an interlocking hook **42** provided on the lower end of the removable segment **32** is removably attached. It should be noted that the illustrated interlocking hook arrangement is one of many possible means for demountably attaching the lower end of the removable segment **32** to the juxtaposed end of the fixed segment **30.** Any other well known interlocking means may be employed such as a clevis shaped channel (not shown) into which a projecting tongue (not shown) is frictionally inserted.

A fastening means is provided to secured the other end of the removable segment **32** to the fixed segment **28.** An end flange **44** is formed on the removable segment **32** and is positioned thereon to contiguously engage a similar flange **46** formed on the juxtaposed end of the fixed segment **28.** Suitable fasteners demountably secure the flange **44** to the flange **46** such as bolts **48** and captive nuts **50.**

It should be readily apparent that any combination of removable fasteners or interlocking devices could be employed at either or both of the locations where removable segment **32** attaches to the fixed segments **28** and **30** without affecting the scope of the invention.

The side edges of the removable segment **32** are provided with depending flanges **52** along the length thereof. Each of the side walls **14** are provided with an elongated arcuate channel **54** into which the flanges **52** of the removable segment **32** are supportingly positioned.

As best seen in FIGS. **3–4,** the channels **54** (one shown) are formed by elongated members **56** which are offset in cross-section. The members **56** are spot welded or otherwise attached to their respective side walls **14.**

An alternate method of forming the channels **54** is illustrated in FIG. **5.** In this modification the arcuate channel **54** is formed by stamping the side walls **14** at spaced intervals along the desired arcuate path to provide a plurality of offset tabs **58** (one shown).

The rotor **22** is illustrated as being formed with two blower wheels **60** and **62** with a pulley **64** positioned between adjacent peripheral flanges **66** of the wheels. The details of construction of the wheels **60** and **62,** the pulley **64** and other wheel-pulley assemblies of similar types are fully disclosed in the hereinbefore referenced U.S. patent application, Ser. No. 133,188, filed Apr. 12, 1971.

It should be noted that the type of rotor illustrated and those disclosed in the referenced U.S. patent application are not intended to limit the scope of the present invention as any type of rotor assembly and drive assembly may be employed.

With reference now to FIG. **6** wherein the rotor mounting arrangement of the present invention is best seen. The blower wheels **60** and **62** are provided with the usual collars **68** which are concentrically slidably positioned on an elongated sleeve **70.** The collars **68** are secured to the sleeve **70** by set screws **72,** and thus form a tubular hub **73** which is fixed to rotate with the rotor **22.**

Each end of the hub **73** has a stub shaft **74** mounted in the bore **76** thereof. Each of the stub shafts **74** are axially slidable within the bore **76** of the hub **73** from an extended position to a retracted position. When the stub shafts **74** are axially extended, as shown, they engage the bearings **20** and thus are rotatably journaled therein. Axially retracting the stub shafts within the bore **76** of the hub **73** disengages the shafts **74** from the bearings **20** so that the rotor **22** may be removed from the blower assembly **10.**

The amount of axial travel of the stub shafts **74** may be controlled by a key-way **78** having closed ends **79** formed in each of the shafts **74** and set screws **80** threadably carried on each end of the hub **73** which engages the key-ways **78.** It should be apparent therefore that the set screws **80** when tightened prevents axial

movement of the stub shafts **74** and also attach the shafts for rotation with the rotor **22.**

A modification of the rotor mounting arrangement is illustrated in FIG. **7.** In this embodiment the stub shafts **74** are biased toward the extended position by a spring **92.** The spring **92** is positioned within the bore **76** of the sleeve **70** and is adapted to biasingly engage the inner end of each of the stub shafts **74.**

Each of the stub shafts is provided with a radially extending pin **93** appropriately secured thereto for limiting axial travel and securing the rotor **22** to the shafts **74** for rotation therewith. The pins **93** extend through and are axially slidable within a slot **94** formed in each end of the sleeve **70.**

Rotation of the rotor **22** may be provided by any of the well-known drive arrangements and therefore the drive assembly best seen in FIGS. **2** and **3** is illustrative only and should not be construed as a limitation of the present invention.

The illustrated drive arrangement includes an electric motor **82** having the usual drive pulley **84.** A V-belt **86** passes over the drive pulley **84** and over the pulley **64** of the rotor **22.** When this type of drive is employed, a slot **88** is provided in the removable segment **32** of the spiral-shaped surface **24** through which the V-belt **86** passes.

It should now be apparent that the removable segment **32** provides a covered access opening **90** through which the rotor **22** may be installed, removed or serviced. Also the axially slidable stub shafts **74** of the rotor **22** in combination with the removable segment **32** facilitates servicing of the blower assembly **10** by eliminating the need for access thereto through the inlets **16** and through the outlet **26.**

While the principles of the invention have now been made clear in an illustrative embodiment, there will be immediately obvious to those skilled in the art many modifications of structure, arrangement, proportions, the elements, materials, and components, used in the practice of the invention, and otherwise, which are particularly adapted for specific environments and operating requirements without departing from those principles. The appended claims are therefore intended to cover and embrace any such modifications within the limits only of the true spirit and scope of the invention.

What I claim is:

1. A rotor for a centrifugal blower assembly comprising:

a. at least one blower wheel having an axially desposed tubular hub

b. a stub shaft mounted in each of the opposite ends of the tubular hub of said blower wheel, each of the stub shafts axially slidable in the tubular hub between an extended and a retracted position; and

c. means cooperating between the tubular hub of said blower wheel and said stub shafts for controlling the axial movement thereof and for fixing said stub shafts for rotation with said blower wheel wherein said means comprises:

1. a set screw mounted adjacent to each of the opposite ends of the tubular hub, said set screws positioned for threaded movement into the bore of the tubular hub; and

2. a key-way formed in each of the stub shafts for engagement with their respective set screws for axially fixidly positioning said stub shafts within the tubular hub and for fixing said stub shafts for rotation with said blower wheel, said key-ways having closed ends for limiting the axial positioning of said stub shafts.

2. A rotor for a centrifugal blown assembly comprising:

a. at least one blower wheel having an axially disposed tubular hub;

b. a stub shaft mounted in each of the opposite ends of the tubular hub of said blower wheel, each of said stub shafts axially slidable in the tubular hub between an extended and a retracted position; and

c. means cooperating between the tubular hub of said blower and said stub shafts for controlling the axial movements thereof and for fixing said stub shafts for rotation with said blower wheel, wherein said means comprises:

1. biasing means mounted within the tubular hub of said blower wheel between said stub shafts for urging said stub shafts toward their extended positions;

2. a pin mounted on each of said stub shafts and radially extending therefrom; and

3. the tubular hub having a slot formed adjacent to each end thereof for slidingly receiving the pins of said stub shafts to limit axial movement thereof and for fixing said stub shafts for rotation with said blower wheel.

3. A centrifugal blower assembly comprising:

a. a pair of spaced apart side walls each having a bearing mounted thereon, the bearings in axial alignment with respect to each other;

b. a rotor having a tubular hub in each end of which an axially positionable stub shaft is mounted, each of the stub shafts axially extendable for rotatably journaling said rotor in the bearings of said side walls and axially retractable for disengaging said rotor from the bearings;

c. means on said rotor and on the stub shafts for controlling axial movements of the stub shafts and for fixing the stub shafts for rotation with said rotor;

d. a spiral-shaped surface mounted between said side walls, said spiral-shaped surface having a pair of fixed segments spacedly arranged to provide an access opening therebetween through which said rotor may be removed or installed, said spiral-shaped surface having a removable segment positioned to close the access opening;

e. attaching means formed on the removable segment and on the fixed segments for demountably attaching the removable segment to each of the fixed segments; and

f. support means formed on each of said side walls and on the opposite side edges of the removable segment for demountably attaching the removable segment to each of said side walls.

4. A centrifugal blower assembly as claimed in claim **3** wherein said means for controlling axial movement of the stub shafts and for fixing the stub shafts for rotation with said rotor comprises:

a. a set screw threadably mounted adjacent to each end of the tubular hub of said rotor; and

b. a key-way formed in each of the stub shafts and positioned therein for frictional engagement with an adjacent one of said set screws.

5. A centrifugal blower assembly as claimed in claim **3** wherein said means for controlling axial movements

of the stub shafts and for fixing the stub shafts for rotation with said rotor comprises:

a. spring mounted within the tubular hub of said rotor between the inwardly disposed ends of the stub shafts, said spring biasingly engaging the stub shafts for urging them axially outwardly;

b. a pin mounted in each of the stub shafts and radially extending therefrom; and

c. the tubular hub of said rotor having a slot formed adjacent to each end of the tubular hub, each of said slots having an adjacent one of said pins axially slidably movable therein.

6. A centrifugal blower assembly as claimed in claim 3 wherein said support means comprises:

a. a side flange formed on each of the opposite side edges of the removable segment of said spiral-shaped surface; and

b. a pair of elongated members, each formed along its length into an arcuate path and formed into an offset in cross-section configuration, each of said elongated members attached to the interior of a different one of said side walls.

7. A centrifugal blower assembly as claimed in claim 3 wherein said support means comprises:

a. a side flange formed on each of the opposite side edges of the removable segment of said spiral-shaped surface; and

b. a plurality of offset tabs formed in each of said side walls, said tabs provided at spaced intervals and positioned in an arcuate path.

* * * * *