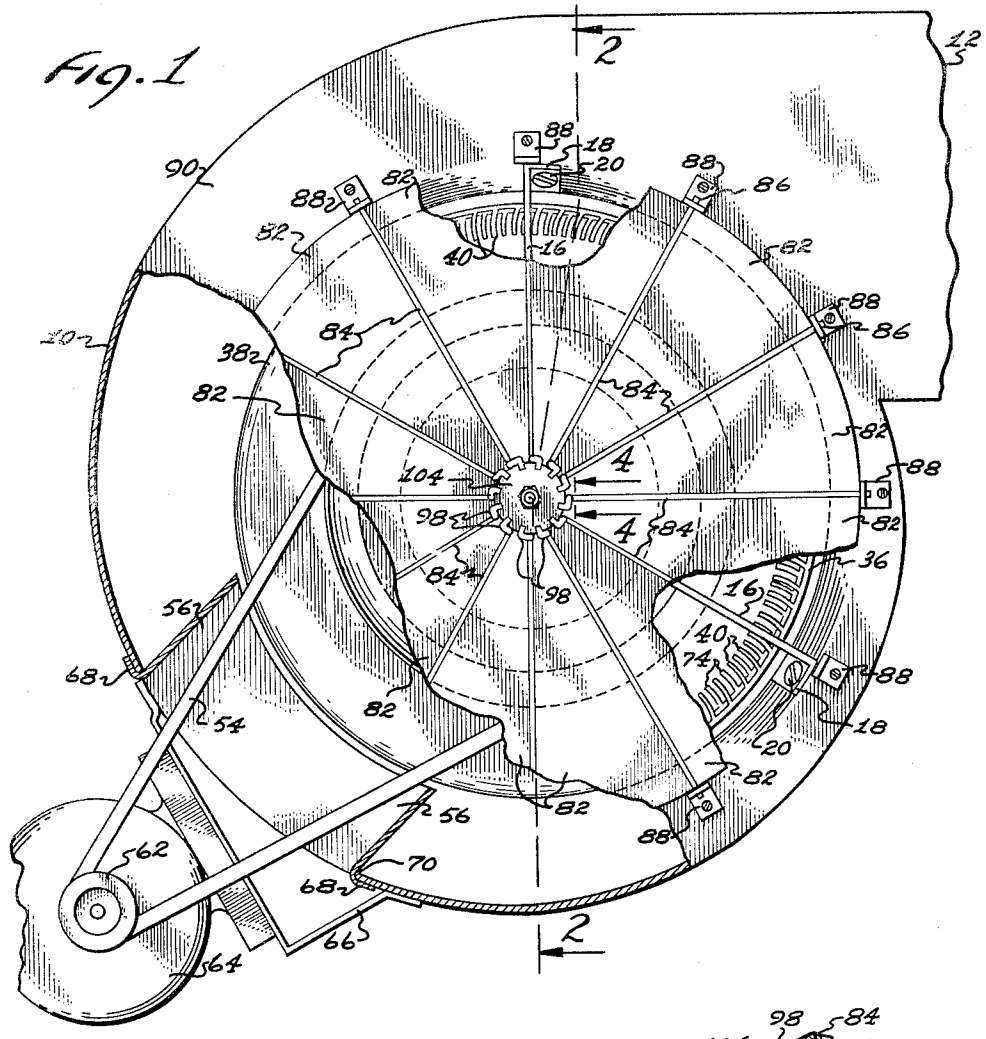
June 22, 1965 A. D. GOETTL 3,190,543

BLOWER CONSTRUCTION

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Fig. 1



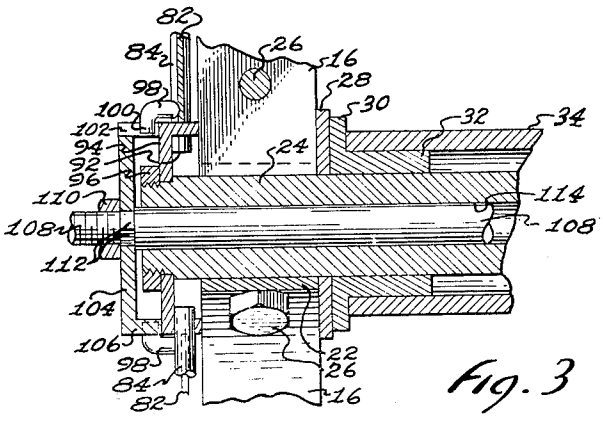


Fig. 3

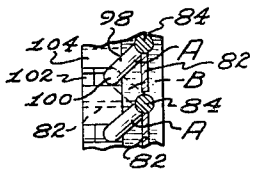


Fig. 4

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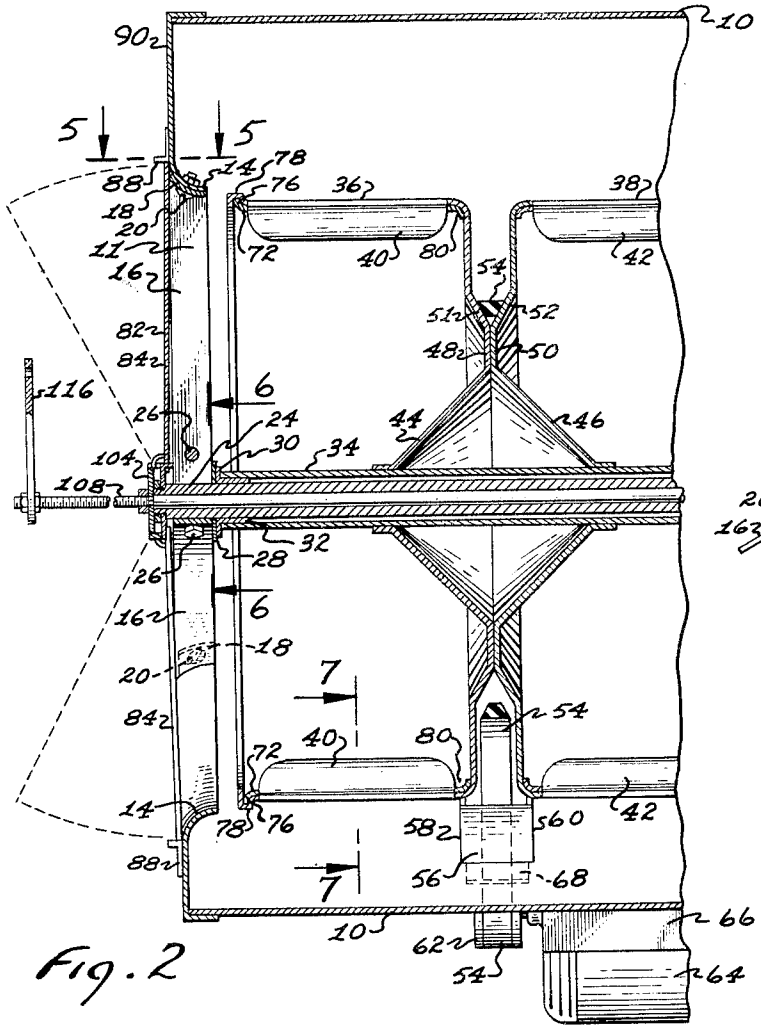


Fig. 2

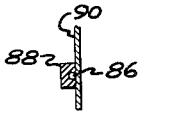


Fig. 5

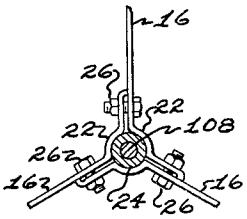


Fig. 6

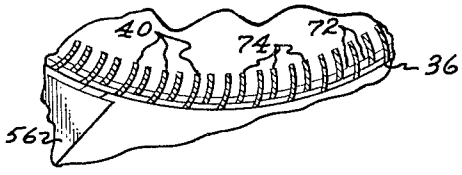


Fig. 7

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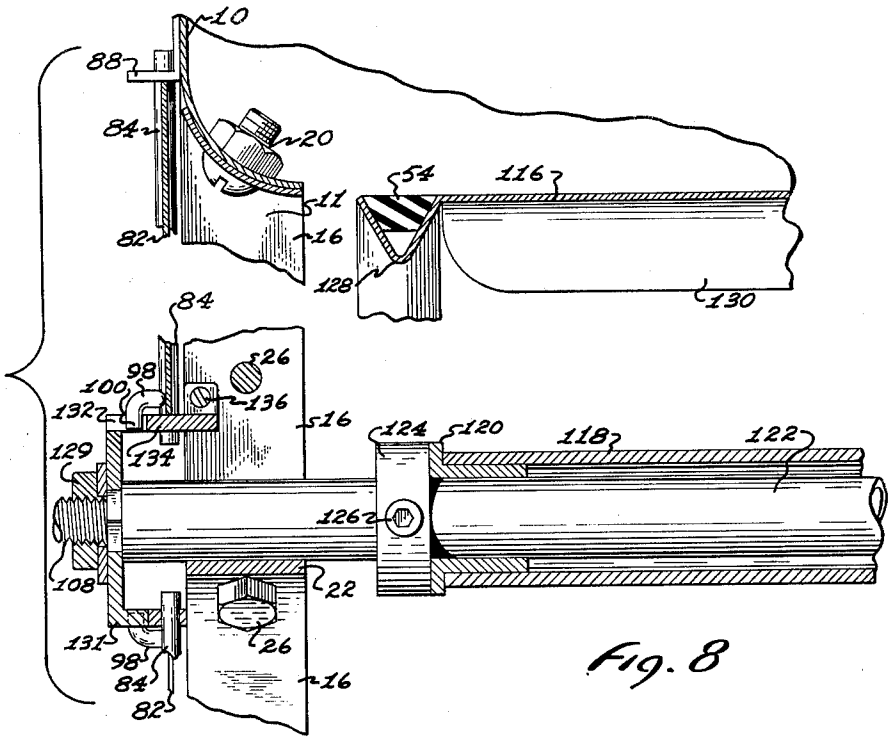


Fig. 8

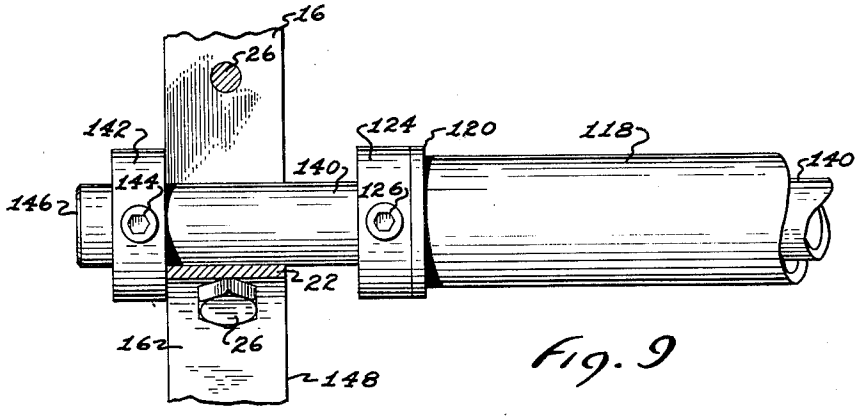


Fig. 9

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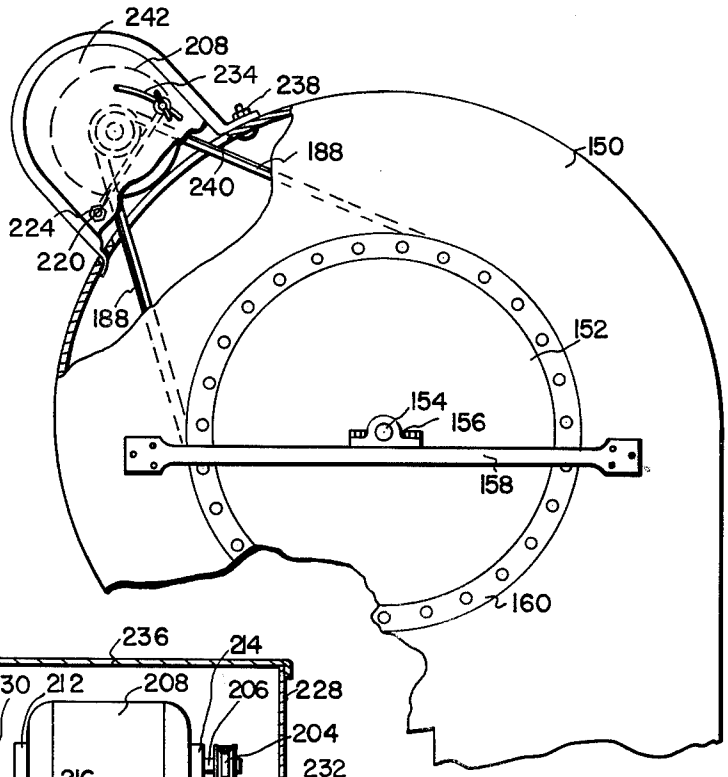


Fig 10

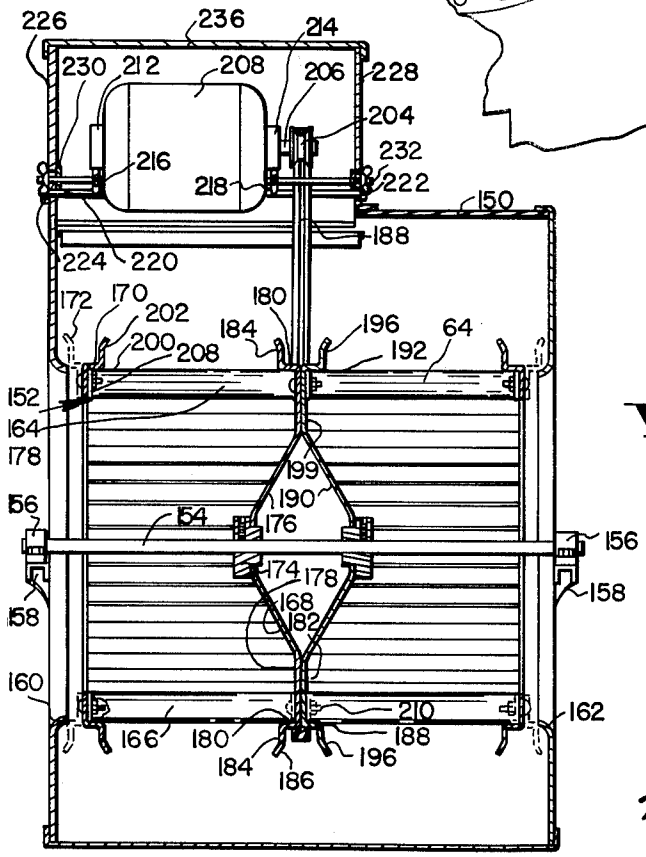


Fig 11

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3,190,543

BLOWER CONSTRUCTION

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Filed Mar. 14, 1963, Ser. No. 265,291
3 Claims. (Cl. 230—117)

This application is a continuation-in-part of my copending application Serial No. 147,102, filed October 23, 1961, now abandoned.

This invention relates to a blower construction and more particularly to a blower construction employing a blower wheel of the bucket type having an axial inlet and centrifugal outlet.

Various means have been employed for driving the rotors of such blowers and the most common of such means is a pulley fixed to the rotor shaft and disposed outwardly of the axial inlet of the blower housing. Such pulleys tend to disturb airflow at the inlet of the blower particularly when the pulleys are of large diameter and in many instances the belts which run over such pulleys are subjected to the flow of air or gases through the blower which have a deteriorating effect on the belts. Additionally, drive pulleys for the blower rotors are costly and oftentime require maintance attention with respect to their connection on the blower shaft.

Accordingly, it is an object of the invention to provide a blower construction wherein a pair of blower buckets are arranged end to end and in opposed relationship wherein adjacent ends of the buckets are formed to provide a converging pulley structure integral with the buckets whereby a belt peripherally engages the pulley portions of the blower buckets and thereby runs substantially out of the airstream passing through the blower.

Another object of the invention is to provide a blower construction wherein a blower rotor is provided with an integral pulley formed on the blower bucket which greatly economizes in the production of blowers and the maintenance thereof.

Another object of the invention is to provide a blower construction comprising a novel rotor mechanism having integral pulley means thereon permitting the blower to be driven from substantially its middle portion whereby the driving belt is engaged over the pulley portions of the rotor and extends outwardly through the blower housing to a motor directly supported on the housing.

Another object of the invention is to provide a blower construction wherein a pair of rotor buckets have opposed axial inlets and contiguous closed ends with converging annular portions forming a pulley which is aligned between the air flow paths of the separate rotor buckets whereby the belt engaging the pulley portions of the rotor is between the air flow paths outwardly of the rotor buckets.

Another object of the invention is to provide a blower construction having a novel rotor driving mechanism which is particularly compatible with the actuation of a vortex damper at each inlet of a blower housing.

Another object of the invention is to provide a novel means for mounting closely spaced blades on the rotors of centrifugal blowers.

Another object of the invention is to provide a novel means for actuating dampers at the inlets of centrifugal blowers.

Another object of the present invention is to provide a novel blower wheel construction having a rotor provided with a substantially rectangular and cross section channel shaped pulley structure on the periphery of the rotor and which is particularly adapted for use in connection with V belts driven by conventional V pulleys on shafts of motors disposed to drive such rotors.

Another object of the invention is to provide a novel blower wheel construction having a pair of opposed rotor

buckets in which end members are provided with peripheral portions opposed to each other, said peripheral portions being offset in opposed relationship to each other and coupled together to provide a substantially rectangular channel shaped and cross section pulley structure having a flat portion disposed to be engaged by a conventional V belt.

Another object of the invention is to provide a novel blower rotor construction having novel substantially channel shaped and cross section rectangular belt engaging structures at the ends of the rotors.

Another object of the invention is to provide a novel blower construction wherein a motor utilized to drive a centrifugal blower rotor is contained in a housing communicating directly with the interior of the blower housing so that air from the rotor cools the motor and permits it to operate at a relatively low temperature in proportion to the loading of the loader.

Another object of the invention is to provide a novel blower construction having novel means for mounting a rotor driving motor adjustably in a portion offset from the conventional blower housing and communicating therewith.

Another object of the invention is to provide a blower construction comprising a novel combination of a blower rotor having a flat belt engaging pulley on its periphery particularly adapted to engage a V belt which is driven by a conventional V pulley on the shaft of a motor disposed to drive the blower rotor.

Further objects and advantages of the invention may be apparent from the following specification, appended claims, and accompanying drawings, in which:

FIG. 1 is a fragmentary side elevational view of a blower construction in accordance with the present invention showing portions broken away and in section to amplify the illustration;

FIG. 2 is a fragmentary sectional view of the blower construction taken from the line 2—2 of FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view of a portion of a vortex damper actuating mechanism taken on substantially the same plane as that shown in FIG. 2;

FIG. 4 is an enlarged fragmentary sectional view taken from the line 4—4 of FIG. 1;

FIG. 5 is a fragmentary sectional view taken from the line 5—5 of FIG. 2;

FIG. 6 is a fragmentary sectional view taken from the line 6—6 of FIG. 2;

FIG. 7 is a fragmentary sectional view taken from the line 7—7 of FIG. 2;

FIG. 8 is an enlarged fragmentary sectional view taken substantially on the same plane as that shown in FIG. 2 of the drawings showing a modification of the invention;

FIG. 9 is an enlarged fragmentary sectional view taken on substantially the same plane as that shown in FIG. 8 but showing a further modification of the rotor shaft and supporting mechanism, and

FIG. 10 is a fragmentary end elevational view of a centrifugal blower in accordance with a modification of the present invention and showing portions of the blower housing broken and in section to amplify the illustration; and

FIG. 11 is a sectional view taken from the line 11 of FIG. 10 showing parts and portions of structure in elevation to facilitate the illustration.

As shown in FIG. 1 of the drawings, the blower construction, in accordance with the present invention, is provided with a housing 10 of substantially conventional configuration for use in connection with a centrifugal blower. This housing is provided with axial inlets 11 and an outlet 12.

As shown in FIG. 2 of the drawings, each inlet 11 is provided with an annular inwardly curved portion 14 to which is bolted bearing struts 16 disposed substantially

120 degrees apart. It will be understood that a greater or lesser number of evenly distributed struts may be employed and these struts at the outer ends 18 are fixed by bolts 20 to the portion 14 at the blower inlet.

As shown in FIG. 6 of the drawings, the inner ends of these struts are provided with arcuate portions 22 which engage the periphery of a central shaft 24 and clamp bolts 26 clamp the struts together so that the arcuate portions 22 support the shaft 24. Disposed adjacent the inner edges of the struts 16 is a washer 28 abutted to a bearing bushing 30 which is provided an extending cylindrical portion 32 surrounding the shaft 24. Running on the bushing portion 32 is a hollow shaft 34 carrying rotor buckets 36 and 38. These rotor buckets 36 and 38 are centrifugal rotor buckets having impeller blades 40 and 42 respectively, all as shown best in FIG. 2 of the drawings.

The rotor buckets 36 and 38 are provided with conical supports 44 and 46 which are fixed to the hollow axle shaft 34 and which conical portions converge toward each other and terminate in disc portions 48 and 50 disposed in a plane at right angles to the axis of the shaft 34. These disc portions 48 and 50 are spot welded or otherwise fixed together as desired to maintain a rigid connection of the blower buckets 36 and 38.

Outwardly of the disc portions 48 and 50 the buckets 36 and 38 are provided with outwardly diverging annular portions 51 and 52 which form a pulley engaged by a belt 54. It will be understood that the pulley formed by the outwardly diverging annular portions 51 and 52 may be located at various radii from the axis of the hollow shaft 34.

It will be understood that opposite ends of the shaft 34 are similarly mounted in the blower housing by means of the struts 16.

The belts 54 as shown in FIGS. 1 and 2 of the drawings, extends outwardly between airflow paths from the blades 40 and 42 and a tunnel 56 is supported by the housing 10 through which the belt 54 passes. It will be seen that opposite sides 58 and 60 and the tunnel 56 are between flow paths through the blades 40 and 42 so that flow losses around the belt and tunnel are held at a minimum. Also air leakage is maintained at a minimum due to the fact that the airflow is adjacent to the sides 58 and 60 and thus low static pressure adjacent the sides 58 and 60 maintains leakage at a minimum.

As shown in FIG. 2 of the drawings, the belt 54 passes around a pulley 62 of a motor 64 which is mounted on a bracket 66 attached to the blower housing 10 adjacent to the tunnel 56. This tunnel 56 is provided with flanges 68 which fit over the outside of the blower housing adjacent to an opening 70 therein through which the tunnel 56 is projected.

As shown in FIG. 2 of the drawings, the blower bucket 36 is provided with an annular blade plate 72 which is disposed internally thereof. This blade plate 72 is provided with blades 74 which are disposed between the blades 40 so that it is possible to have blades more closely spaced than provided by the punched out blades of a conventional bucket type rotor.

The blade plate 72 is provided with an outwardly curved annular rim 76 which is retained in an annular channel portion 78 at the periphery of the rotor bucket 36 adjacent its inlet portion. The opposite edge 80 of the plate 72 is spot welded to the bucket 36. As shown in FIG. 7 of the drawings, the blades 74 carried by the plate 72 and disposed between the blades 40 provide for a greater concentration of blades in the bucket type rotor and thus permits the conventional fabrication of bucket type rotors where the blades are punched out of the bucket itself. This permits the disposition of the auxiliary blades carried by the blade plate 72 to be located between the punched out blades on the buckets.

Reference is now made to a vortex damper of the present blower construction which is particularly compatible with the rotor driving mechanism hereinbefore described and the bearing structure for supporting the rotor assembly.

As shown in FIG. 1 of the drawings, the vortex damper comprises a plurality of substantially triangular damper members 82 which are mounted on rods 84 having their outer ends 86 pivotally mounted in brackets 88 which are secured to the outer side 90 of the blower housing. It will be seen that the rods 84 project through openings in the brackets 88 as shown in FIG. 5 of the drawings.

As shown in FIG. 3 of the drawings, the inner ends 92 of the rods 84 are pivotally mounted in a ring 94 held on the shaft 24 by a nut 96. Secured to the rods 84 are bell crank arms 98 having ends 100 disposed in slots 102 in the periphery of a flanged actuating disc 104. This disc 104 is provided with an axial flange 106 in which the slots 102 are disposed. The disc 104 is fixed to an actuating rod 108 by a nut 110. The rod 108 is provided with flats 112 to hold the disc 104 against rotation thereon.

The actuating rod 108 is rotatably mounted in a bore 114 centrally of the shaft 24.

It will be understood that the blower construction of the present invention may be provided with a similar mechanism on the opposite ends of the shaft 24 and actuating rod 108.

Fixed to the rod 108 is an actuating lever 116 which may be operated by any suitable means as desired.

When the actuating rod 108 is rotated by the lever 116, the actuating disc 104 rotates relative to the member 94 whereby the slots 102 act on the ends 100 of the arms 98 and pivot the rods 84 together with the damper members 82 as indicated in FIG. 4 of the drawings. Thus, the rotation of the disc 104 causes the arms 98 to move from the solid line positions A to a dash line position B thereby pivoting the rods 84 and the damper members 82 substantially ninety degrees. It will be understood, however, that any desired adjustment less than 90 degrees may be accomplished if desired.

In the modification as shown in FIG. 8 of the drawings, a blower wheel bucket 116 is mounted on a hollow shaft 118 carried by cylindrical bushings 120 mounted on a shaft 122 having a collar 124 adjacent the bushing 120. The collar 124 is fixed to the shaft 122 by means of a conventional screw 126.

The blower bucket 116 is provided with an annular V-shaped in cross-section integral belt pulley portion 128 adjacent the inlet 11 of the blower housing 10. It will be understood that the belt pulley portion 128 is formed of sheet metal and is integral with the blower bucket 116. The bucket 116 is provided with conventional centrifugal blower blades 130 which are punched out of the sheet metal bucket. This sheet metal bucket is provided with a conventional closed end which is mounted on the shaft 118 in the conventional manner.

Struts 16 similar to those shown in FIG. 6 of the drawings, support a shaft 122 which is rotatably mounted in the arcuate portions 22 of the struts 16. Fixed on the end of the shaft 122 by means of a nut 129 is an actuating disc 131. This actuating disc 131 is similar in construction to the disc 104 shown and described in connection with FIG. 3 of the drawings. This disc 131 is provided with peripheral slots 132 which engage the ends 100 of the arms 98 herebefore described. The arms 98 are mounted on the shafts 84 and carry the dampers 82.

The inner ends of the shafts 84 are pivotally mounted in a cylindrical bracket 134 which is mounted by means of screws 136 on the struts 16.

In operation of the modified structure, the shaft 122 may be rotated by a lever 116 such as shown in FIG. 2 of the drawings or by any other suitable means as desired. The shaft 122 rotates together with the collar 126 and carries the bushings 120, and during rotation of the shaft

122 the disc 131 actuates the arms 98 and pivots the damper plates 82. Thus, the vortex damper may be opened or closed to any desired degree. The vortex damper of the present invention is particularly compatible with the blower bucket driven by the belt 54 since the pulley for the belt, according to the present invention, is internally of the blower housing and does not obstruct operation of the vortex damper adjacent the axial inlet portions of the blower.

It will be understood that replacement of the belt 54 may be accomplished by an axial displacement of the rotor supporting shaft relative to the struts 16. This may be accomplished by removing the nut 129 and loosening the collars 124 so that the shaft may be axially displaced beyond the struts 16 to permit the insertion of the belt into its position around the pulley 128. A similar operation may be accomplished in connection with the structure shown in FIGS. 1 and 2 of the drawings.

In the modified structure shown in FIG. 9 of the drawings, the vortex damper is omitted and the collar 124 with its set screw 126 permits the supporting shaft 140 to be moved axially of the rotor supporting shaft 118. The shaft 140 is a hollow shaft and is held in the struts 16 by the arcuate portions 22 and bolts 26. The shaft 140 on its outer end adjacent to the struts 16 is provided with a collar 142 having a set screw 144 which fixed the collar on the shaft.

When it is desired to displace the shaft 140 axially, the set screws 126 and 144 are loosened permitting the shaft 140 to be slidably moved axially within the hollow shaft 118 so that the end 146 of the shaft 140 may be disposed in spaced relationship to the inner sides 148 of the struts 16 whereby the belt 54 may be changed relative to the integral pulley on the blower rotor.

In the modification of the invention as shown in FIGS. 10 and 11 of the drawings of a centrifugal blower housing 150 is provided with a rotor 152 rotatably mounted therein on a shaft 154 carried by conventional bearings 156 mounted on cross members 158 spanning the inlet eyes 160 and 162 of the blower housing 150.

The rotor 152 is composed of a pair of opposed bucket portions one of which communicates with the blower inlet eye 160 and the other of which communicates with the blower inlet eye 162, the bucket structure communicating with the inlet eye 160 is similar to the bucket structure communicating with the inlet eye 162 and therefore will be described in detail.

Mounted on the shaft 154 is a bucket structure indicated generally at 164 which comprises blades 166 cantilevered from an end plate 168 and an end flange plate 170 together with a similar opposed plate 172 all of which will be hereinafter described in detail.

The end plate 168 is mounted on the shaft 154 by means of a hub 174 and the plate 168 is provided with a conical section 176 having its center mounted on the hub 174 radially extending portions 178 of the plate are disposed in a plane at substantially a right angle to the axis of the shaft 154 and of the rotor 152. These portions 178 are provided with offset portions 180 which are disposed in a plane substantially parallel to the axis of the shaft 154 and extend over ends 182 of the blades 166 to form half of a flat pulley structure which will be hereinafter described. Integral with these offset portions 180 are radially extending flange portions 184 which flange portions 184 are spaced from the plane of the portion 178.

The flanges 184 are each provided with an outwardly flared portion 186 disposed to provide an annular end play guide for a belt 188 which will be hereinafter described in detail.

The bucket structure of the rotor 152 which communicates with the inlet eye 162 is provided with an end plate 190 similar to the plate 168 and this plate 190 is provided with an offset annular portion 192 similar to the portion 180 of the plate 168. This portion 192 is integral with a radially disposed portion 194 which is contiguous with and coupled to the radially extending plate portion 178 of the end plate 168.

Integral with the offset portion 192 is a flange portion 196 similar to the flange portion 184 hereinbefore described.

The offset portions 180 and 192 are opposed to each other and are disposed in a plane which is substantially parallel to the axis of the shaft 154 to provide a flat belt engaging pulley structure. The flanges 184 and 196 are spaced apart a distance greater than the width of the belt 188 to provide a lateral running tolerance while the incline flange portions 186 provide a normal guide for guiding the belt 188 into the space of the flat pulley structure between the flanges 184 and 196.

Opposite ends of the blade 166 from their connection with the portion 178 of the end plate 168 are connected to the ring-shaped end flange plate member 170 having an annular offset portion 200 similar to the portion 180 hereinbefore described and integral with this portion 200 is an annular flange portion 202 which is similar to the flanges 184 and 196 and all of these flanges are disposed in a plane substantially at right angles to the axis of the shaft 154.

Thus, each end flange plate 170 and 172 is provided with the flange 198, offset portion 210, and flange 202. The end flange plates 170 and 172 are disposed in a similar manner to the equivalent portions of the end plates 168 and 190 of the opposed bucket structures of the rotor. Thus, a flat, generally rectangular, channel shaped and cross section pulley structure may be provided at the middle of the rotor 152 and surrounding its periphery or may be in a similar position at each opposite end of the rotor.

Opposite ends of the blades 166, may be coupled to the flange structures in any suitable manner as for example, by rivets or other means.

The belt 188 which engages the flat pulley structure at the periphery of the rotor as hereinbefore described also engages the generally V-shaped and cross section pulley 204 on a shaft 206 of a motor 208 so that frictional engagement of the belt 188 with the V-shaped pulley 204 is capable of driving the rotor. This pulley 204 is small and the channel shaped pulley on the rotor hereinbefore described is large, permitting a relatively high speed motor to be used which provides for more efficient cooling of the motor as well as economy in the procurement thereof. Additionally, it will be appreciated that the flat channel shaped belt structure comprising the flanges 180, 192, 184, and 196 reduces friction of the large pulley structure surrounding the rotor, it permits lateral tolerance of the belt on the pulley and due to the fact that this is a flat pulley only the inner surface 210 of the belt frictionally engages the pulley on the blower rotor thus, tends toward freedom and minimum friction of the belt. Further, the belt is narrower than the distance between the flanges 184 and 196 thereby permitting some lateral freedom in the operation of the belt in driving the flat pulley of the blower rotor.

The motor 208 is provided with conventional resilient mount structures 212 and 214 with which bars 216 and 218 are connected. These bars 216 and 218 are connected to a rod 220 which is provided with nuts 222 and 224 on opposite ends which engage side panels 226 and 228 of an extended portion of the blower housing 150. The rod 220 is pivotally mounted in the panels 226 and 228 and coupled to the bars 216 and 218 are lateral extensions 230 and 232 movable through arcuate slots 234 in the panel 226 and 228. Wing nuts in the extensions 230 and 232 provide for the securement relative to the panels 226 and 228. Thus, the slots 234 are arcuately disposed about the axis of the rod 220 and thereby permit adjustments of the motor 208 and the pulley 204 relative to the axis of the rotor 152 in order to adjust the belt 188 to maintain proper tension thereof.

It will be seen that the extension of the housing **150** comprising the panels **226** and **228** includes a cover **236** which is coupled to the end panels **226** and **228** and is secured by bolts **238** to the housing **150**.

The housing **150** is provided with an opening **240** communicating directly with the rotor and with the interior of the housing extension **242** which comprises the panels **226** and **228** and the cover **236**. Thus, in operation, air moved by the rotor **152** communicates directly with the interior of the housing extension **242** thereby cooling the motor **208** and permitting it to run at a highly loaded condition due to such an efficient cooling. Thus, the motor operates within design temperature limits at a relatively high loading as compared with the operation of conventional blower motors.

It will be obvious to those skilled in the art that various modifications of the present invention may be resorted to in a manner limited only by the just interpretation of the following claims.

I claim:

1. In a blower construction, the combination of: centrifugal blower housing having a pair of opposed axial inlets and centrifugal outlet means; a central shaft coaxial with said inlets; a rotor structure rotatable about the axis of said shaft and comprising a pair of rotor bucket structures having inlets opposed to each other; said buckets carried by said shaft and having adjacent end structures fixed together in a plane disposed at right angles to said shaft, said adjacent end structures provided with annular surfaces which diverge radially forming an annular belt pulley groove between said adjacent end structures; and a belt surrounding said belt pulley and extending outwardly through the side wall of said blower housing.

2. In a blower construction, the combination of: a centrifugal blower housing having a pair of opposed axial inlets and centrifugal outlet means; a central shaft coaxial with said inlets; a rotor structure rotatable about the axis of said shaft and comprising a pair of rotor bucket structures having inlets opposed to each other; said buckets

carried by said shaft and having adjacent end structures fixed together in a plane disposed at right angles of said shaft said adjacent end structures provided with annular surfaces which diverge radially forming an annular belt pulley; a belt groove between said adjacent end structures disposed in said belt pulley groove and extending outwardly through the side wall of said blower housing; and a tunnel structure extending from the side wall of said blower housing inwardly around said belt and between the paths of air flowing centrifugally from said buckets.

3. In a blower construction, the combination of: a centrifugal blower housing having a pair of opposed axial inlets and centrifugal outlet means; a central shaft coaxial with said inlets; a rotor structure rotatable about the axis of said shaft and comprising a pair of rotor bucket structures having inlets opposed to each other; said buckets carried by said shaft and having adjacent end structures fixed together in a plane disposed at right angles to said shaft, said adjacent end structures provided with annular surfaces which diverge radially forming an annular belt pulley; and a belt between said adjacent end structures disposed in said belt pulley, and outwardly extending through the side wall of said blower housing; and a motor mounted on said blower housing and having a pulley over which said belt is engaged.

References Cited by the Examiner

UNITED STATES PATENTS

2,100,489	11/37	Richardson	230—114
2,113,391	4/38	Bartlett et al.	230—114
2,932,445	4/60	Hathaway	230—134.5
2,975,961	3/61	Rodick	230—117

FOREIGN PATENTS

843,211	3/39	France.
829,536	1/52	Germany.

LAURENCE V. EFNER, *Primary Examiner.*