Dec. 1, 1959 J. F. KOCHEVAR ET AL 2,915,240

BLOWER WHEEL CONSTRUCTION

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Fig. 1.



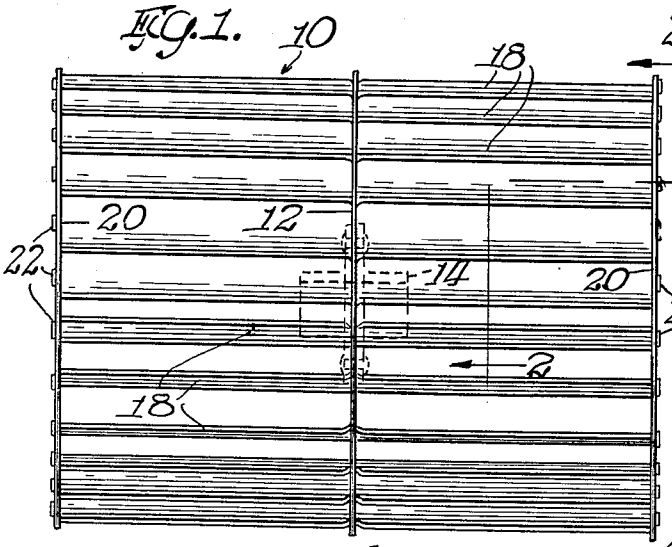


Fig. 6.

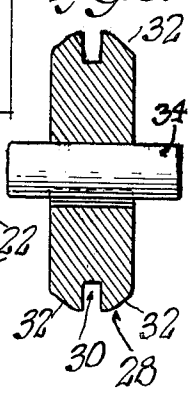


Fig. 3.

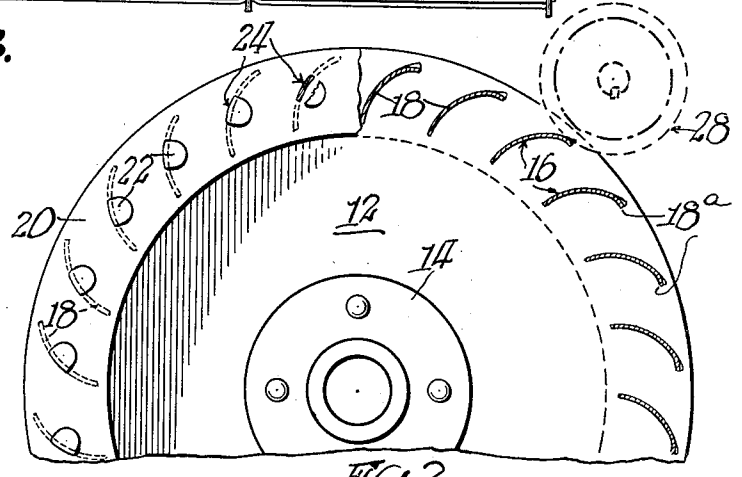
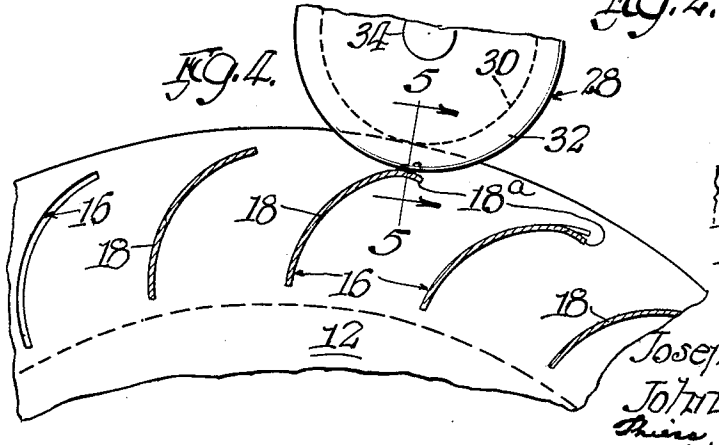


Fig. 2.

Fig. 4.



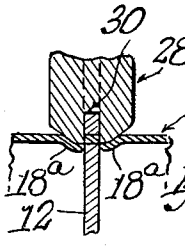


Fig. 5.

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BLOWER WHEEL CONSTRUCTION

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4 Claims. (Cl. 230—134)

The present invention relates to an improved blower construction and a method for producing the same.

The manufacture of centrifugal blower assemblies composed of vanes or blades arranged about concentric supporting rings or plates had heretofore been open to one or more serious objections. Heretofore, if a rigid blower wheel construction was desired, it was necessary that the blades be composed of heavy gauge materials, if they were elongate in nature.

It is apparent that with blades of considerable length, flexing of the unsupported blade center portions causes wheel vibration during operation. Thus, if the length of the blower was substantial, one practice was followed of securing the inner ends of two sets of uniform blades to a centrally disposed plate member and securing the outer end of each series of such blades to one of two opposed slotted end rings. The two sets of blades were secured to the center plate by staggering the connecting arrangement thereof about the plate periphery. Other methods of securing elongate blower blades to a central plate or spider member are found in the prior art which are tedious and time-consuming resulting in great expense of manufacture.

It has been found in accordance with the teachings of this invention that a rigid blower assembly which may be composed of blades of thin gauge materials is possible if a novel method of attaching a plurality of elongate blower vanes to a center plate is followed.

It is an object, therefore, of this invention to provide a novel method for assembling blower blade members to a blade-supporting plate.

It is another object of this invention to provide a rigid blower assembly which does not require the use of discrete securing means or welding or similar operations.

It is a still further object of this invention to provide a method for making blower wheels which is highly efficient and particularly adapted for high-speed production.

It is yet another object of this invention to provide a novel blower assembly which is composed of a minimum number of basic components which are all inexpensive to fabricate.

The above and other objects of this invention will become more apparent upon proceeding with the following description when read in the light of the accompanying drawing and appended claims.

In one embodiment of the provided blower construction a central plate which is uniformly slotted about its periphery is provided together with two apertured end plates. A plurality of blade members are also utilized in the blower construction which are snugly receivable within the central plate slots. Formed integrally with opposed ends of each blade member are lugs or ears of reduced cross section. The blades are arranged so as to traverse the central plate and become secured to the opposed end rings by having the lugs or ears thereof traverse the apertures disposed in the rings; the lugs

are thereafter bent so as to lockingly engage the end rings.

The central portion of the center plate comprises a hub for purposes of being secured to a drive shaft which is driven by a motive means such as a motor or the like.

Following the blade assembly with the concentrically aligned center plate and end rings, the blades are locked to the center plate by means of the following procedure. A deforming wheel having a centrally disposed recess in the periphery thereof is arranged so as to enable the central recess thereof to engage and ride about the periphery of the center plate traversed by the blower blades. The opposed raised wheel portions defining the central wheel recess depend a sufficient distance along the opposed surfaces of the center plate so as to shear blade edge portions disposed toward the center plate periphery and deform the same thereby defining opposed shoulder portions which lock each blade member to the center ring. After the deforming wheel has traveled about the entire center plate periphery, each blade will be rigidly secured thereto whereby relative movement between the latter blower components is prevented.

For a more complete understanding of this invention, reference should now be had to the drawing wherein

Figure 1 is a front elevational view of a centrifugal blower made in accordance with the teachings of this invention;

Fig. 2 is an enlarged elevational view of the blower of Fig. 1 partly in section taken on line 2—2 of Fig. 1 illustrated in cooperating relationship with a deforming wheel;

Fig. 3 is a perspective view of a blade member utilized in the illustrated blower construction;

Fig. 4 is an enlarged fragmentary view of a deforming wheel member in the process of engaging a central blade portion of the illustrated blower construction;

Fig. 5 is a sectional view taken on line 5—5 of Fig. 4; and

Fig. 6 is a diametrical sectional view of the deforming wheel illustrated in Figs. 3, 4 and 5.

Referring now to the drawing, and more particularly to Fig. 1, a fan or blower wheel **10** is illustrated which is of the multiple blade type. In the latter type of blower construction, air is taken into the blower at each axial end and discharged radially of the wheel for peripheral discharge from a fan housing outlet. The latter housing is not shown since the present invention is primarily concerned with a blower wheel construction and the method of making the same.

The blower wheel **10** comprises a center plate **12** which has a central bearing or hub portion **14**. The latter hub portion is adapted to be keyed or otherwise suitably secured to a rotatable drive shaft member not shown which will impart rotational movement to the blower wheel. Since in some blower constructions it may be desirable to have blower portions of unequal length on opposite sides of the plate **12**, the term "center plate" in the claims where used shall be constructed to mean a plate which is disposed intermediate the ends of the blower. As will be more clearly seen in Fig. 2, the central plate **12** is slotted uniformly adjacent the periphery thereof. These latter slots **16** enable elongate blade members **18** one of which is illustrated in Fig. 3 to traverse the center plate thickness. The slot is of such a configuration so as to snugly receive a blade member **18**.

The remainder of the blower construction illustrated comprises opposed end rings **20** which are adapted to engage bendable finger portions **22** formed integrally with opposed ends of each blade **18** as illustrated in Fig.

3. It will be noted from Fig. 2 that each end ring **20** is uniformly apertured about its annular area so as to snugly receive a blade finger **22**.

Thus, in the normal course of blower assembly, after each blade **18** has traversed the center plate **12** each end ring engages the fingers **22** disposed at opposed ends of the blade members **18**. The fingers **22** traverse the openings **24** in each end ring and are bent at right angles to the remainder of the blade in the manner illustrated in Fig. 2. To assure permanence of assembly, the bent finger portions **22** may be welded or otherwise secured to the outer surfaces of the rings **20** against which they are disposed after the latter interlocking operation.

A construction is thus effected following the above-described operations in which a center plate is traversed by a plurality of blade members **18** and the opposed end limits of each blade member are secured to the end rings **20** which engage the blade fingers **22**.

If the blower wheel blade members are somewhat long, it is apparent that in the normal course of rotation, vibration of the wheel will take place. This vibration will be owing to the flexing of the blades and, more particularly, the center portions thereof. However, if the center portion of each blade is secured in relatively immovable relationship to the illustrated center plate **12**, a rigid blower assembly will be effected; such an assembly will not vibrate in the normal course of rotation.

Figs. 2, 4 and 5 illustrate a manner in which each of the elongate blade members **18** of the provided blower construction may be secured to the center plate **12**. The only apparatus needed in effecting the latter assembly comprises a deforming wheel or upsetting roll **28** illustrated in Fig. 6. It will be noted from the latter sectional view that the periphery of the upsetting roll **28** is centrally relieved at **30**. Roll portions **32** disposed on either side of the recess **30** have rounded outer edge portions for purposes which will hereinafter be made more apparent. The illustrated roll is keyed or otherwise secured to a shaft member **34**.

The dimensions of the annular recess **30** disposed in the upsetting roll **28** are such as to enable the roll **28** to engage or rotatably ride about the periphery of the center plate **12**. Thus, the width of the annular recess **30** is such as to snugly receive the thickness of the center plate **12** therein. The depth of the recess **30** disposed in the upsetting roll **28** is sufficient to enable portions of the roll portions **32** having the greatest diameter, and which define opposed edges of the recess **30**, to engage those blade portions disposed adjacent the opposed peripheries of the center plate **12** and shear or otherwise deform the same along planes disposed parallel to the opposed surfaces of the latter plate **12**.

The portion or length of blade which will be sheared is obviously dependent upon the depth of the roll annular recess **30**. It will be noted from Fig. 6 that, because of the substantially curvilinear configuration of the diametrical cross section of the illustrated deforming or upsetting roll **28**, cutting of the blade will only take place along planes coincident with opposed surfaces of the center plate and the deformation of adjacent blade portions will be along tapered lines, as illustrated in Fig. 5. Thus, shearing in two places of each blade member on opposed sides of the center plate **12** is prevented. The deformation resulting from the engagement of the upsetting roll **28** with a blade member **18** is clearly shown in Fig. 5. Blade portions **18***a* disposed adjacent each side of the center plate **12** are removed from the plane of the remainder of the blade **18** as a result of the deformation of center portions of each blade **18**; that is, as a result of the formation of the shoulders **18***a* on each side of the center plate **12**, each blade will be securely locked to the center plate **12**.

It is apparent that preliminarily to having the upsetting roll **28** engage the entire periphery of the center plate **12**, care should be taken to insure that the plate preferably engages substantially the exact center of each blade member **18** for optimum reinforcing effect.

Fig. 4 illustrates the slight length of blade edge portion which need be deformed to assure a stable blade-center plate assembly. In effecting the deformation of the central portions of each blade **18**, it is immaterial whether the blower assembly **10** remains stationary and the deforming roll **28** moves about the periphery thereof or whether the latter roll remains stationary and the blower assembly moves so as to have the periphery of the center plate **12** engage the recess **30** of the roll **28**. Also, although blade portions are illustrated as being cut for purposes of becoming locked to the center plate, it may be desirable merely to "dimple" or deform blade portions without cutting the blade thickness.

It is thus apparent that a centrifugal blower wheel has been provided which utilizes a minimum number of component parts and which is arranged in a state of rigid assembly without the necessity of utilizing discrete securing means or securing operations such as welding or the like. The center plate-blade assembly is readily effected in a minimum amount of time and with a minimum expenditure of effort. The final blower assembly is rigid in nature and will assure efficient operation. By utilizing the above-described method, the need for employing two short sets of blade members where an elongate blower wheel construction is desired and the need for employing securing means or difficult securing operations is entirely dispensed with.

Certain modifications of the above described wheel and process for forming the same may be made which will still lie within the ambit of the inventive concepts disclosed. It is apparent, for instance, that a number of blade constructions other than that described may be employed for securing the opposed ends of each blade member to the oppositely disposed end rings. Although the blades **18** are illustrated as having a curvilinear cross-sectional configuration, it should be noted that the provided method will function to advantage regardless of the blade cross section. Also it is apparent that the above described method is not necessarily limited to use with a member having a substantially imperforate cross section, but may of course be equally adapted for locking blades with rings and the like.

We claim:

1. In a blower wheel construction, the combination comprising plate means having a plurality of slots disposed therein, blade means traversing said plate means, each of said blade means having a central portion thereof disposed in a plate slot whereby movement of said blade relative to said plate in a direction substantially transverse to said blade's longitudinal axis is prevented, each of said blades also having edge portions thereof sheared from engagement with said blade portion disposed in sad plate slot abutting against opposed side portions of said plate whereby movement of said blade relative to said plate in a direction parallel to the longitudinal axis of said blade is prevented, said sheared edge portions being removed from the plane of the blade central portion within the plate slot.

2. In a blower wheel construction, the combination comprising plate means having a plurality of spaced slots adjacent its periphery, blade means snugly disposed in each of said slots and traversing said plate means, each of said blade means having a portion therof disposed in a plate slot whereby movement of said blades relative to said plate in a direction substantially transverse to said blades' longitudinal axes is prevented, and edge portions of said blade means sheared from engagement with said blade portions within said plate slots disposed at an acute angle to the planes of said blades abutting against opposed side portions of said plate whereby movements of said blades relative to said plate in a direction parallel

to the longitudinal axes of said blades is prevented, and a pair of end rings secured to the ends of said blade means disposed on opposite sides of said plate means.

3. In a blower wheel construction, a center plate, said center plate being slotted adjacent its periphery, elongate blade members snugly receivable in said center plate slots and traversing said plate, end rings disposed on opposed sides of said center plate, each of said blade means having a portion thereof disposed in a plate slot whereby movement of said blades relative to said plate in a direction substantially transverse to said blades' longitudinal axes is prevented, each of said blade means also having edge portions sheared from engagement with said blade portion disposed in said plate slot abutting against opposed side portions of said plate and removed from the plane of the blade portion within the plate slot whereby movement of said blades relative to said plate and parallel to the longitudinal axes of said blades is prevented, protuberances of reduced cross section formed integrally with opposed end limits of each of said blade members, said end rings having slots disposed throughout their annular area, said blade protuberances traversing said slots and being snugly received therein and having distal portions thereof radially disposed on each of said end rings in the normal assembled position.

4. In a blower wheel construction, the combination comprising annular means having a plurality of slots disposed about peripheral portions thereof, elongate means traversing said annular means and having portions thereof disposed within said slots whereby said slots are substantially completely filled by said elongated means

traversing portions, edge portions of said elongate means sheared along the planes defining opposed sides of said annular means and sheared from contact with edge portions of said elongate means disposed in said slots, said latter sheared edge portions being removed from the plane of said elongate means portions disposed in said slots and abutting against opposed sides of said annular means, portions of said elongate means formed integrally with and disposed adjacent said sheared edge portions remaining in the plane of the remaining portions of said elongate means disposed in the slots of said annular means.

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