April 12, 1960 L. ZARO 2,932,446

BLOWER WHEEL

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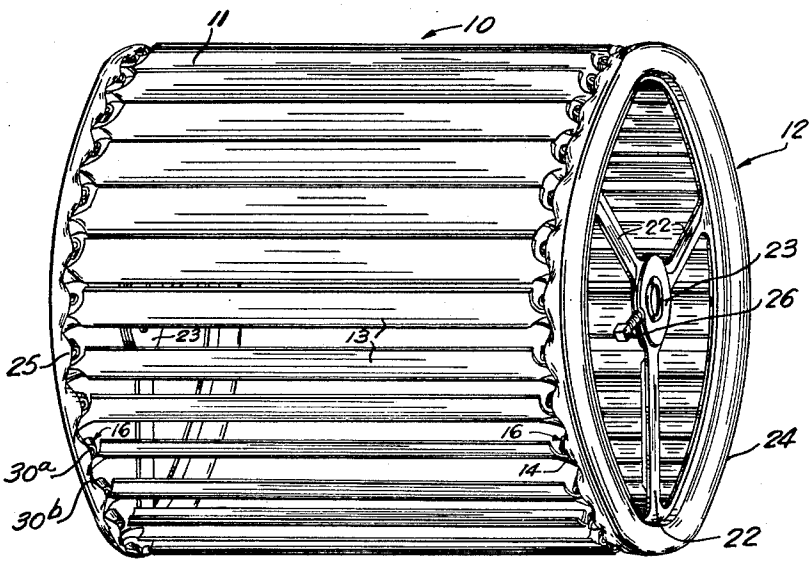


FIG. 1

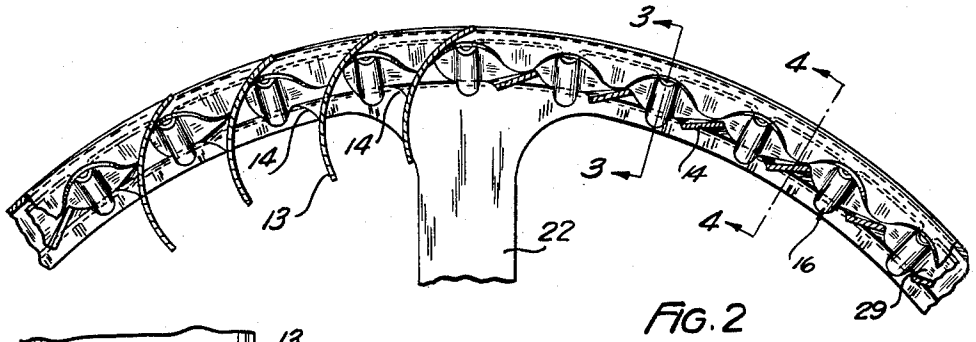


FIG. 2

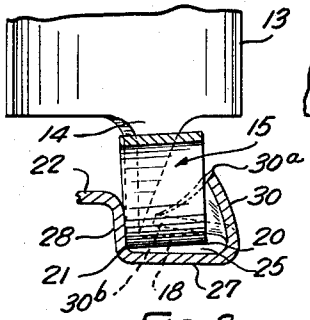


FIG. 3

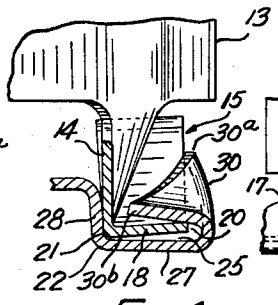


FIG. 4

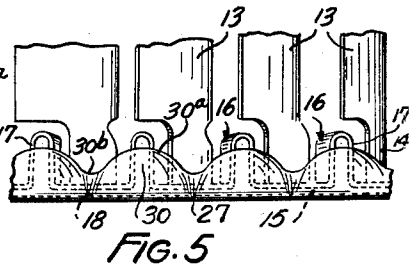


FIG. 5

INVENTOR.
LOUIS ZARO
BY Hudson, Boughton, Williams, David & Hoffmann
ATTORNEYS

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BLOWER WHEEL

Louis Zaro, Cleveland Heights, Ohio, assignor to Morrison Products, Inc., Cleveland, Ohio, a corporation of Ohio

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8 Claims. (Cl. 230—134)

The present invention relates to blowers, fans and the like of the centrifugal type and more particularly, the present invention relates to a new and simplified blower wheel construction having important advantages over the prior art.

One of the principal objects of the present invention is to provide a blower wheel requiring a minimum number of parts which are of a simplified configuration and wherein the assembly of the wheel is effected without the use of the customary fastening means, and without need for expensive welding equipment nor the time-consuming procedure of forming individual welds between the pairs of blades.

Another object of the present invention is to provide a simplified sheet metal joint for a blower wheel comprising a spider connected to a bladed annulus, which joint is devoid of any welded, brazed, or soldered connection and/or sheet metal fasteners such as screws, bolts, rivets, clips, or the like.

A further object of the present invention is to provide a novel and simplified blower wheel construction comprising a bladed annulus and a spider and wherein the annulus and spider are connected by a crimped or locked engagement between cooperating portions thereof.

Another object of the present invention is to provide a novel blower wheel comprising an end spider and a bladed annulus and wherein the spider includes a channel-shaped rim having an end ring of the annulus locked therein by a crimped engagement of portions of the rim thereagainst.

Yet another object is to provide such a novel blower wheel construction in which the end ring of the bladed annulus is corrugated and wherein the crimped engagement of the rim of the spider therewith is at annularly spaced points corresponding with recesses of the corrugations.

Another object of the present invention resides in a strong, resiliently locked construction for securing the corrugated blower wheel end rings fomed by gathers between blades thereof to spider wheels devoid of any individual welds around the end rings of the reel between blades thereof.

The invention further resides in certain novel features of construction, and combinations and arrangements of parts, and further objects and advantages thereof will be apparent to those skilled in the art to which it pertains from the following description of the present preferred embodiment thereof described with reference to the accompanying drawings in which similar reference characters represent corresponding parts throughout the several views, and in which:

Fig. 1 is a perspective view of a sheet metal blower wheel embodying one form of the new and novel construction which is a part of the present invention;

Fig. 2 is a vertical sectional view with certain parts of Fig. 1 broken away, taken along a plane perpendicular to the axis of rotation of the blower wheel between the ends thereof;

Fig. 3 is a sectional view of the new and novel joint of the illustrative embodiment taken along section line 3—3 in Figure 2;

Fig. 4 is another sectional view of the construction of the joint taken along section line 4—4 in Figure 2; and

Fig. 5 is essentially an elevational end view of the joints shown in Figures 3 and 4.

Before explaining in detail a preferred embodiment of the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. It is to be understood also that the phraseology or terminology employed herein is for the purpose of description and not of limitation, and it is not intended to limit the invention herein claimed beyond the requirements of the prior art.

Referring more particularly to Figure 1 of the illustrative embodiment of the present invention, the centrifugal blower wheel indicated generally by the reference numeral 10 comprises an annular reel or bladed annulus 11 in assembly with a mounting means, in this case, a pair of wheel-like parts or spiders 12 at either end thereof for mounting the assembled blower wheel on a drive shaft, not shown.

The reel 11 consists of a stamped sheet metal strip which has been partially sheared and deflected to form thereon a plurality of generally parallel blades 13 of convex-concave cross-sectional shape so that air is forced outwardly upon the rotation of the reel. Each of the blades 13 is connected at each end thereof by means of a stem 14 to a substantially annularly extending strip or end ring 15. The blades 13 are spaced closely together by forming gathers 16 in the strips 15 between the pairs of blades.

The gathers are of a channel-shaped or U-shaped construction having sides 17 extending in the same general direction as the axis of rotation of the reel 11. As shown in Figs. 3 to 5, each of slanted portions 18 of the ring 15 which extend between and connect the gathers 16 are flat and lie in a plane extending transverse to the rotation axis of the reel. The ring 15 can be referred to as a corrugated member or ring by reason of its having the offsets or gathers 16 therein in alternating relation to the intervening connecting portions 18. A desired pitch for each of the convex-concave sheet metal blades 13 is formed in the process of manufacture by twisting the connecting stems 14 of the blades 13 to a suitable extent.

The corrugated strip or end ring 15 is preferably not cylindrically disposed with respect to the rotation axis of the blower wheel 10 but, for reasons which will become more apparent as the description develops and as best seen in Figures 3 and 4, is tilted or inclined so that the generally flat portions 18 of this strip are inclined towards the blades 13 and relative to a transverse plane extending perpendicularly to the rotation axis of the blower wheel. The inclination of the end ring 15 can be any suitable amount, for example five or ten degrees or more, and is such that the outer annular edge or corner 20 is relatively closer to the ends of the blades 13 than the inner annular edge or corner 21.

Each of the spiders 12 is preferably of a sheet metal construction and has a plurality of radial arms, in this case three such arms 22, connecting a suitable hub 23 with an outer rim or peripheral edge 24. The rim 24 is of a channel-shaped or U-shaped cross section and has an annular channel recess 25 therein. The hub 23 is

provided with a set screw 26 for locking the hub onto the drive shaft.

The channel-shaped outer rim 24 of each spider 12 has a flat annular base or radial wall portion 27 connected to the radial arms 22 by an annular connecting leg or flange 28. The radial portion 27 forms the bottom wall of the channel recess 25 and the flange 28 forms one of the side walls of the channel recess 25. A second annular leg or flange 30 forms the other leg or side of the channel-shaped recess 25 and has a scalloped or corrugated appearance for reasons which will be brought out.

The end ring 15 is disposed in the channel recess 25 of the spider rim 24 and, in accordance with the present invention, is retained and locked therein by deflected or crimped portions 30*a* and 30*b* of the outer annular flange 30 of the rim. The flange portions 30*a* and 30*b* are deflected or crimped different amounts, as will be further explained hereinafter, and because of the presence of these deflected portions therein, the flange 30 is of the corrugated shape or scalloped character referred to hereinabove.

The position of the end ring 15 in the channel recess 25 is with the flat connecting portions 18 of the ring adjacent to but not touching the bottom wall 27 of the recess and preferably inclined thereto by the amount of the angular inclination of the end ring 15 which is mentioned above. The end ring 15 is also disposed with the annular edge or heel portion 21 thereof engaged against the side wall 28, as shown in Figs. 3 and 4, and which engagement forms a fulcrum means for the end ring.

Portions 30*a* of each of flanges 30 are crimped so as to be inclined inwardly for tightly engaging and at least partially enclosing the outer edges of parallel sides 17 of each of the gathers 16 for deflecting the same counterclockwise, Figs. 3 and 4, about fulcrum edge 21. Intermediately each of the gathers 16, the flange portions 30*b* are crimped or deflected axially and radially downwardly and inwardly towards flat radial base portion 27 in a clockwise direction about fulcrum edge 21 so as to tightly engage edges 20 of strips 15 and generally tend to cause a slight deflection thereof in a direction axially outwardly of the reel 12 towards the base 27 of rim 24. Thus, the more tightly the crimped or scalloped portions 30*b* engage the outer edges 20 of the periphery of each of strip portions 18, the more the generally annular strip 15 is caused to be deflected toward the base portion 27 of spider 12 for forming a locked connection. In contradistinction thereto, the tightly crimped portions 30*a* serve to prevent the deflection of flat portions 18 by biasing or twisting gathers 16 in an opposite direction. As a result, not only is each strip 15 biased against the annular connecting flanges 28 of rims 24, but the strips 15 are interlocked with the scalloped flanges 30 for assuring locked connections of the spiders 12 with the reel 11. The locked connection is a type which is stressed for preventing relative movement between the spiders and the reel.

In accordance with the description of the preferred embodiment of the present invention developed, the end rings 15 of the reel 11 are securely clamped to the rims 24 of the spiders 12. The twisting or torsional stressing of end strips 15 and the tensioning of each of the heel portions 21 defined by a connecting stem 14 and an annular strip 15 under the action of the inclined walls 28, radial portions 27, and crimped and locked portions 30 is so effective that no relative movement can take place between the spiders 12 and reel 11.

It is apparent from the foregoing description that the assembled reel or blower 10 is of a very simplified construction which is rigid throughout with very little opportunity for the reel 11 to become loose relative to the spiders 12, due to the tensioning and locking arrangement hereinabove set forth. An additional advantage of the present construction is that no fastening devices

such as bolts, screws, etc., or welding, brazing, or soldering, and more especially, no individual welds between the pairs of blades at numerous points around the end rings are needed in the present invention. Consequently, the present invention, of which a preferred embodiment has been herein above described, is of very simple construction, and, therefore, less costly to manufacture, particularly due to the fact that welds between the pairs of blades at the end rings of the reel have been eliminated.

While I have shown and described a specific embodiment in accordance with my invention, it is understood that the same is susceptible of many changes and modifications, as known to a person skilled in the art, and I intend to cover all such changes and modifications embraced by the scope of the appended claims.

Having thus described my invention, what I claim is:

1. An article of manufacture of the kind described comprising, a generally cylindrical first part having annularly spaced blades and a ring portion connecting said blades, gathers formed at circumferentially spaced points in said ring portion, and a second part having a generally annular channel-shaped rim, said ring portion being disposed in the channel recess of said rim, said rim having crimped first portions engaging said ring portion between said gathers and second crimped portions engaging said gathers and holding said ring portion in locked engagement in said rim, said first and second portions tending to displace said ring portion in opposite directions.

2. An article of manufacture of the kind described comprising, a sheet metal connection for rigidly securing a first annular sheet metal means with a second annular sheet metal means, said first annular means comprising a generally channel-shaped rim member, said second annular means comprising an annular corrugated strip disposed in said channel-shaped rim member, said strip having bottom portions connecting corrugations thereof and inclined relative to a wall of said channel-shaped member, the outer peripheral edge of said channel-shaped member being inclined towards and in frictional engagement with the adjacent edge of said strip for the biasing thereof towards the base of said channel-shaped member.

3. In a blower comprising, a plurality of axially extending parallel blades defining a cylindrical reel, and hub wheels rigidly secured to each end of said reel for mounting said reel upon a shaft means and providing a support therefor, and annular strip means disposed at each end of said reel and connecting said blades together in spaced apart relationship, each of said hub wheels having an axially facing channel-shaped annular rim for receiving said annular strip means therein with a portion thereof being inclined with respect to said rim, and the outer edge of said rim being directed inwardly and engaging and biasing said inclined strip portion into said channel-shaped rim.

4. In a blower as set forth in claim 3, wherein said inclined annular strip means is corrugated so as to form axially extending U-shaped gathers connected together by said inclined portions and said outer edge of said rim alternately engages said gathers and said connecting inclined portions.

5. In a blower as set forth in claim 4, wherein said rim outer edge is scalloped in shape, and said rim outer edge engages the gathers of said annular strip means in such manner as to prevent relative angular displacement therebetween.

6. An article of manufacture as set forth in claim 2, wherein said outer peripheral edge of said channel-shaped member is scalloped to alternately engage a corrugation and a connecting inclined bottom portion of said annular corrugated strip.

7. In a blower wheel of the character described a plurality of parallel blades disposed about a central axis and defining a cylindrical reel; said blades having stems at the ends thereof connected by integral annular ring

means; and hub means having annular channel-shaped rim means connected to said ring means; said annular ring means comprising a strip having axially extending gathered portions and transversely extending intermediate portions between said gathered portions; said channel-shaped rim having axially extending inner and outer walls and a connecting bottom wall; said ring means being disposed in said rim with said intermediate portions contacting said bottom wall and inclined away therefrom; said gathered portions being restrained against radial movement by said inner and outer walls; said outer wall having crimped portions extending between said gathered portions and in pressing engagement with said intermediate portions, whereby said ring means is retained in said rim means with said intermediate portions being in stressed relation to said gathered portions.

8. In a blower wheel of the character described a plurality of parallel blades disposed about an axis of rotation and defining a cylindrical reel; said blades being connected at the ends thereof by integral annular ring means; and hub wheels secured to said ring means for mounting said reel upon a shaft in a supporting relationship for rotation about said axis; said annular ring means comprising strips having axially extending gathers between adjacent blade ends and having intermediate portions between said gathers and extending transverse to said axis, said hub wheels each comprising an annular channel-shaped rim having a bottom wall extending substantially normal to said axis and having inner and outer side walls extending from said bottom wall; said strips being disposed in said channel-shaped rims with said intermediate portions in contact with said bottom walls and inclined with respect thereto, said gathers being constrained against radial movement by said side walls; portions of said outer side walls being crimped and extending between said gathers in pressing and deflecting engagement with said inclined intermediate portions of said strips, whereby said strips are retained in said rims and are there held in stressed condition by said crimped portions of said outer wall.

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