Jan. 11, 1966 J. GOETTL ETAL 3,228,591

BLOWER WHEEL CONSTRUCTION

Filed March 30, 1964 2 Sheets-Sheet 1

Fig 1

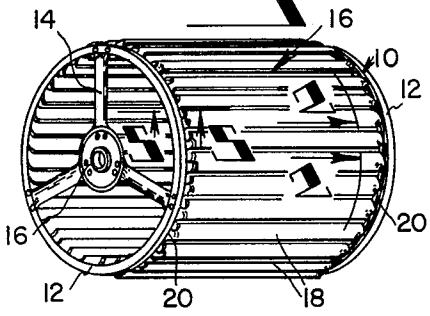


Fig 8

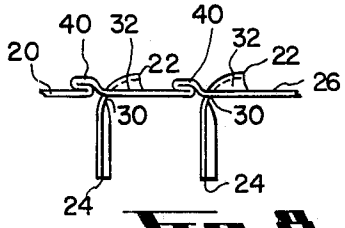


Fig 2

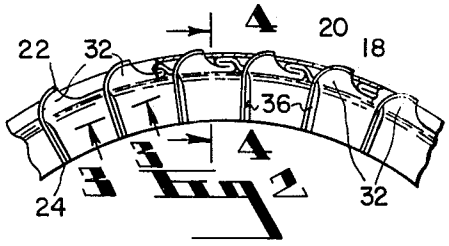


Fig 5

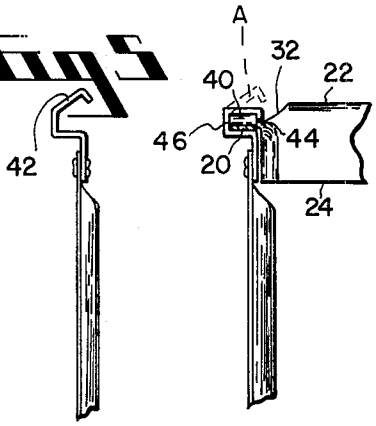


Fig 4

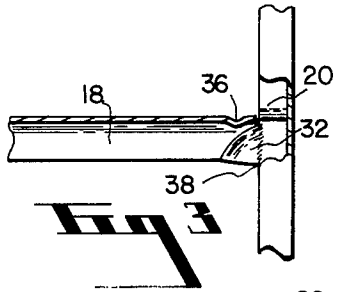
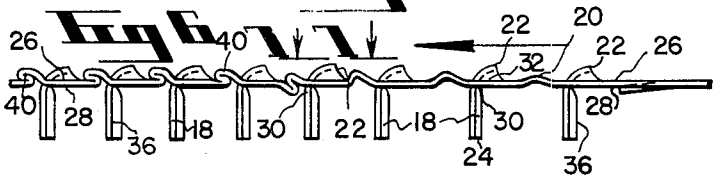


Fig 3

Fig 6



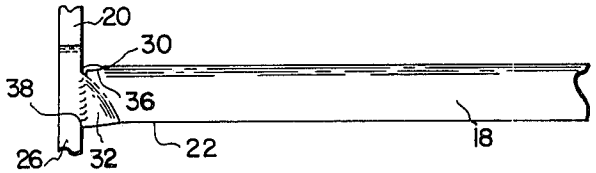


Fig 7

INVENTOR.
JOHN. GOETTL
JOHN M. GOETTL
BY
Wm. H. Dean

Jan. 11, 1966 J. GOETTL ETAL 3,228,591

BLOWER WHEEL CONSTRUCTION

Filed March 30, 1964 2 Sheets-Sheet 2

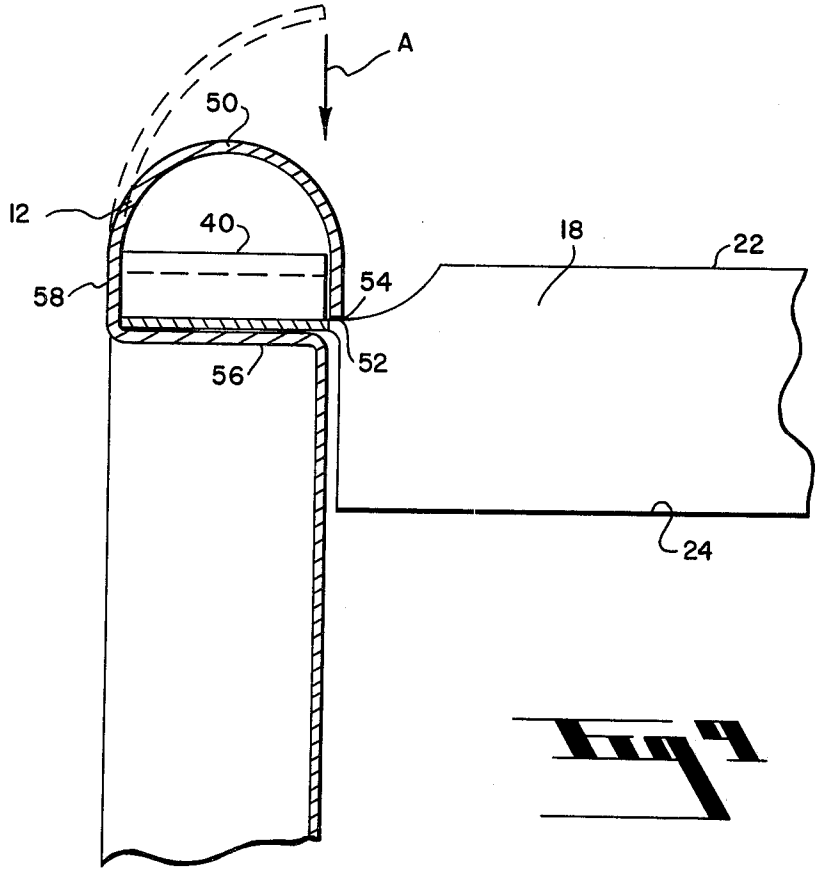


Fig. 4

INVENTOR.
JOHN GOETTL
JOHN M. GOETTL

BY Wm. H. Dean

United States Patent Office 3,228,591 Patented Jan. 11, 1966

3,228,591

BLOWER WHEEL CONSTRUCTION

John Goettl and John M. Goettl, Phoenix, Ariz., assignors to McGraw-Edison Company, Milwaukee, Wis., a corporation of Delaware

Filed Mar. 30, 1964, Ser. No. 355,883
12 Claims. (Cl. 230—134)

This application is a continuation-in-part of our copending application, Serial No. 274,509 for blower wheel construction, filed April 22, 1963, now abandoned.

This invention relates to a blower wheel construction and more particularly to a novel blower wheel construction comprising an annular row of elongated laterally spaced blades formed of a single sheet of metal.

Various air moving devices utilize generally bucket shaped or hollow cylindrical blowers having an annular row of laterally spaced substantially parallel elongated blades and some of the prior art structures of this nature have been constructed of plastic while others have been made of sheet metal.

Those structures formed of sheet metal are usually made by dies; and elongated strips of sheet metal are formed with the blades extending laterally thereof whereupon such strips when the blades are completely formed therein may be wrapped into a cylindrical shape wherein the blades are in an annular row and end members may be secured to the sheet metal structures at opposite ends of the blades to form a conventional hollow cylindrical generally bucket shaped blower wheel.

In the forming of such sheet metal blower wheels it has been a problem to obtain substantial structural connection of opposite ends of each blade with side strips of a sheet metal from which the blades are formed.

It is highly desirable to attain a substantial portion of the cross section of each blade in an integral relation with strips disposed at right angles to the blades and interconnecting adjacent ends of the blades, opposite edges of the blades in prior art sheet metal blower structures are cut free of the strips to which a median portion of the cross section of these blades are integral, thus, opposite edges of the blades at their ends are usually free of the strips which interconnect the blades and, thus, a minor portion of the cross section of each blade is integral with the connecting strips.

It has been desirable to attain a substantial cross section at the end of each blade in an integral relationship with connecting strips disposed at right angles to the blades so that sound, durable and vibration free structures will result in the fabrication of such blower wheels.

Heretofore the ends of the blades at their junctures and integral connections with strips disposed at substantially right angles thereto have been weak and have been connected only by a nominal portion of the cross section of each blade at a median portion only thereof, thus, leaving the opposite edges of each blade at each end thereof free and subject to incipient failure at a connection with the connecting strips for the blades.

Accordingly, it is an object of the present invention to provide a blower wheel construction wherein an annular row of elongated, substantially parallel spaced blades are formed of a single sheet of metal, therefore, integral with each other and wherein opposite ends of the blades have a substantial portion of their cross sectional structure integral with connecting strips disposed substantially at right angles to these blades.

Another object of the invention is to provide a blower wheel construction in which a plurality of parallel blades are formed of a single sheet of metal and integral at their ends with strips at substantially right angles thereto; said ends of said blades having cross sectional structure extending from one edge of the blade to a median portion thereof, this cross sectional structure being integral with the connecting strip structure and formed into an offset structural configuration which permits both of the edges of the blade to be disposed in laterally spaced relationship with the sides of the strip interconnecting the ends of these blades.

Another object of the invention is to provide a novel blower wheel construction which comprises a plurality of elongated laterally spaced blades all integral with a single sheet of metal and which may be formed into an annular cylindrical blade assembly which is very strong and of efficient configuration.

Another object of the invention is to provide a blower wheel construction wherein a plurality of elongated laterally spaced blower blades are formed of a single sheet of metal and wherein opposite ends of these blades are integral with strips disposed at substantially right angles thereto, the ends of the blades being formed laterally and offset to provide a very strong structural transition between the blades and the respective integral strips which interconnect them.

Another object of the invention is to provide a blower wheel construction wherein a plurality of elongated laterally spaced blower blades are formed of a single sheet of metal and wherein opposite ends of these blades are integral with strips disposed substantially at right angles thereto; the strips being gathered and folded between the blades; and an annular channel crimped over said folded portions of said strips; said annular channel having a resilient annular loop which, when formed over the folded portions is resiliently deflected against the blade structures adjacent the folded portions, whereby normal spring back of the material after being formed is compensated for to retain tension of an annular edge of the annular channel with the blades and to thereby prevent them from rattling or being loose in their connection with the annular channel structure.

Another object of the invention is to provide a blower wheel construction which is very simple and economical to produce, efficient in operation, and extremely durable due to offset structure at opposite ends of the blades which supports braces and integrally interconnects the blades with common sheet metal structure forming a part of a single sheet from which all of the blades are initially formed.

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

FIG. 1 is an isometric view of a blower wheel constructed in accordance with the present invention;

FIG. 2 is an enlarged fragmentary sectional view taken from the line 2—2 of FIG. 1;

FIG. 3 is an enlarged fragmentary section view taken from the line 3—3 of FIG. 2;

FIG. 4 is a fragmentary sectional view taken from the line 4—4 of FIG. 2;

FIG. 5 is a sectional view taken from line 5—5 of FIG. 1 showing a rim and hub structure of the blower construction in accordance with the present invention shown before attachment to an annular assembly of blower blades;

FIG. 6 is a plan section of a single sheet of metal showing the formation of blower blades thereof in accordance with the present invention;

FIG. 7 is a fragmentary plan view taken from the line 7—7 of FIG. 6 showing the offset structure connecting one end of a single blade with a strip disposed at substantially right angles thereto and formed of a common piece of metal, said strip being common to and integral with a plurality of such blades, as shown in FIG. 6;

FIG. 8 is an enlarged fragmentary view similar to a portion of FIG. 6 showing the detail of offset portions connecting the blades integrally with connecting strips at the ends thereof and, also, showing folded portions of the connecting strips intermediate adjacent ends of the blades; and

FIG. 9 is an enlarged fragmentary sectional view similar to FIG. 4 and showing a modified annular channel structure of the blower wheel hub having an annular edge resiliently formed into engagement with the blades of the structure inwardly of the folded strip portions with which the blades are integral to thereby provide for spring back compensation of the materials when the annular channel structure is formed to ultimately attain a tight engaged relation of the annular hub structure with the blades.

As shown in FIG. 1 of the drawings, a blower wheel **10**, constructed in accordance with the present invention is provided with a pair of end rim members **12**, each of which is provided with a spider structure **14** and a shaft engaging hub structure **16**.

As will be hereinafter described, an annular assembly **10** of blower blades is formed of a single sheet of metal and deflected into a cylindrical form and secured to the rims **12** to form a hollow cylindrical blower.

The assembly **10** comprises a plurality of elongated, substantially parallel, laterally spaced blades **18**, the opposite ends of which are integral with strips **20**, as will be hereinafter described. Each blade **18** is provided with opposite edges **22** and **24**, both of these edges **22** and **24** are disposed laterally of respective opposite sides **26** and **28** of each strip **20**. The blades are provided with opposite ends each of which is integral with one of the strips **20** Each blade **18** forming a median portion **30** thereof to its edge **24** is cut free of each strip **20** while each blade at each end thereof from its median cross sectional portion **30** is integral with each strip **20** to the respective edge **22** thereof. This is shown in FIG. 7 of the drawings wherein an offset portion **32** permits the cross section of the blade or the cross sectional structure of the blade at its end to be integral with the strip and yet to have the edge **22** disposed laterally of the respective side **26** of the strip. This offset structure **32** is shown in FIGS. 4 and 7 of the drawings, and is also illustrated in FIGS. 2, 6 and 8 of the drawings. It will be seen that the portion of each blade **18** from the median portion **30** to the edge **24** is substantially straight in cross section while the cross sectional portion extending from the median portion **30** to the edge **22** is curved and integral with the respective offset portion **32**. This respective offset portion **32** extends generally on an angle from the respective edge **22** down to the side **26** of each strip **20**, thereby lending very rigid structural support to each opposite end of each blade **18** and extending out to the respective edge **22** of each of these blades. This structure is particularly shown in FIGS. 4 and 7 and while it permits the edge **22** to be laterally disposed relative to the side **26** of each strip **20**, it causes a slight shortening of the structure at the end of the blades during forming, thereby tending during the forming operation to pull the strips **20** slightly toward each other. This is accompanied by a lateral indentation of each blade **18** near each end thereof and in a location extending from the median portion **30** to the edge **24**, this indentation is shown in FIG. 3 and is designated **36**. This indentation **36** is disposed laterally of each blade near its end to cause shortening comparable to the shortening of the offset portions **32**. The indentation **36** may be termed offset portion and serves to stiffen the ends of the blades which are integral with each strip **20**, thus, it will be seen that during the forming of each blade **18** at its opposite end that the offset portion **32** is formed to permit lateral disposition of each edge **22** relative to a side **26** of each strip **20** and that the offset portion **36** is formed to provide a comparable shortening of each end of each blade **18** as compared to that caused by the offset portion **32** when formed integral with each blade **22** and each strip **20**. The offset portion **32**, as shown in FIG. 7 and as shown in FIG. 3, is, thus, integral with each end of each blade **18** from the edge **22** thereof to the median portion **30** thereof and this offset portion extends in alignment with the edge **22** to an integral connection with the respective strip **20** at **38**, as shown in FIGS. 3 and 7 of the drawings.

Each strip **20** is provided with a gathered or folded portion **40** between adjacent ends of adjacent blades **18**, as shown best in FIGS. 2, 4, 6 and 8 of the drawings. These folded portions **40** comprise portions of the respective strip **20** which are folded against themselves to gather the blades **18** closer together and, thus, the folded portions **40** provide structure which is offset laterally and extending beyond the side **26** of each strip **20**. These folded portions **40** are, thus, conveniently located to be engaged by an annular hub portion **42** of each rim **12**, thereinbefore described. This structure is shown in FIGS. 4 and 5 of the drawings. The annular rim **42** is initially formed, as shown in FIG. 5, and is then rolled into position so that a hook portion **44** of the annular rim **42** is engaged inwardly of an edge **46** of each folded portion **40** so that the strip **20** is maintained captive in the rim and is held in an annular disposition so that the assembly **10** of the blades **18** is a hollow cylindrical annular assembly, all of which is readily accomplished since the strips **20** are thin, narrow, sheet metal strips readily deflectable between the blades **18**. The assembly **10** is wrapped around the rims **12** and the annular hook portion **42** is formed downwardly from a broken line position A, as shown in FIG. 4 of the drawings, to the solid line position at which location the hook **44** which is annular and engages each and every folded portion **40**. These are alternately disposed between adjacent ends of the blades **18**.

In accordance with the foregoing it will be appreciated that the angularly disposed offset portion **32** which is integral with each strip **20** strengthens the present blower wheel structure.

It will be appreciated that the forming of the offset portions **32** and **36** at opposite ends of the blades **18** causes some shortening of the structure at the end of these blades and consequently pulling of the strips **20** closer together in order to permit the formation of the offset portion **32** so that an integral connection of each opposite end of the blade is provided with the respective strip **20** and that this offset portion and integral connection is coextensive with a median portion of the blade to the edge **22**, as hereinbefore described.

In the modification, as shown in FIG. 9 of the drawings, an annular channel structure **50** of each rim **12** is similar to the hook structure **42**, shown in FIG. 5 of the drawings. However, this annular channel structure **50**, as shown in FIG. 9 of the drawings, is substantially semicircular in cross section and is arched in spaced relation from the folded portions **40** of the blades **18**. The arched spaced relationship of this annular channel structure **50** permits an inner annular edge **52** of the annular channel to bear upon outer surfaces **54** of the blades **18** adjacent the folded portions **40** in such a manner that normal spring back of the material following assembly forming is compensated for so that tension of the edge **52** against the surface **54** of each blade **18** is always maintained. As for example, when the annular edge **52** is formed inwardly into contact with the surfaces **54** of the blades **18** in a direction as indicated by an arrow A, in FIG. 9 of the drawings, the edge **52** is formed inwardly a sufficient distance to contact the surface **54** and deflect it slightly in the direction of the arrow A. This inward deflection of the blades **18**, as the folded portions are held on the annular ledge **56** of the rim structure **12**, permits the blades **52** to be deflected inwardly relative to the folded portions **40** so that when the forming of the annular channel **50** is completed and when the edge **52** tends to spring back slightly, the initial deflection of the portion **54** of each blade **18**, also, tends to spring back outwardly in a direction op-

posite to the arrow A. Inasmuch as the annular edge **52** of the channel **50** is formed inwardly and due to its arcuate structure, it tends to spring back a lesser amount in the opposite direction of the arrow A than does the relatively flat portion **54** of each blade **18**. Thus, lateral tension of each blade **18**, due to its normal spring back tendencies, causes the portion **54** of each blade **18** to bear strongly against the annular edge **52** while the folded portions **40** are restrained by the annular ledge **56** in the opposite inward direction. Thus, the ends of the blades **18** are always maintained tightly captive in the annular channel **50** by means of the folded portions **40** and the initially deflected portion **54** adjacent thereto. The inwardly directed edge **52** of the annular channel **50** holds the folded portions captive in one direction while on opposite annular side **58** of the annular channel **50** holds each folded portion **40** from movement in the opposite direction.

It will be appreciated by those skilled in the art that the spring back tension afforded by the portion **54** of each blade **18** in a direction opposite to the arrow A maintains each blade **18** tightly engaged with the inwardly directed annular edge **52** of the channel **50** at each opposite end of each blade **18**.

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 a just interpretation of the following claims.

We claim:

1. In a blower wheel construction the combination of: an annular assembly of elongated blades spaced laterally with respect to each other and formed of a single sheet of metal, said blades all integral therewith; a pair of strip portions of said sheet metal spaced from each other and integral with opposite ends of said blades; opposite sides of said strip portions being common to respective opposite sides of said sheet; said blades having opposite edges disposed longitudinally thereof; cross sectional structure of each blade extending from one of its edges to the other edge thereof and being disposed generally at an angle to said sides of said strip portions; one of said edges being spaced laterally with respect to said strips at one respective side of each strip, the other of said edges being spaced laterally with respect to a respective opposite side of each of said strips; each blade being at each end thereof integral with said strips throughout its cross section structure from a median portion of the cross section structure to one of said edges; and offset structure of each blade extending from said last mentioned edge generally on an angle thereto and on an angle to one of the said sides of said strips, said offset structure, thus, forming an integral structural connection between said last mentioned edge and said strips and disposed angularly with relation thereto; folded portion of said strips disposed between adjacent ends of said blades; the planes of said folded portions being wholly disposed in substantially parallel relation to said opposite sides of said strips.

2. In a blower wheel construction the combination of: an annular assembly of elongated blades spaced laterally with respect to each other and formed of a single sheet of metal, said blades all integral therewith; a pair of strip portions of said sheet metal spaced from each other and integral with opposite ends of said blades; opposite sides of said strip portions being common to respective opposite sides of said sheet; said blades having opposite edges disposed longitudinally thereof; cross sectional structure of each blade extending from one of its edges to the other edge thereof and being disposed generally at an angle to said sides of said strip portions; one of said edges being spaced laterally with respect to said strips at one respective side of each strip, the other of said edges being spaced laterally with respect to a respective opposite side of each of said strips; each blade being at each end thereof integral with said strips throughout its cross section structure from a median portion of the cross section structure to one of said edges; and offset structure of each blade extending from said last mentioned edge generally on an angle thereto and on an angle to one of the said sides of said strips, said offset structure, thus, forming an integral structural connection between said last mentioned edge and said strips and disposed angularly with relation thereto; folded portion of said strips disposed between adjacent ends of said blades, the planes of said folded portions being wholly disposed in substantially parallel relation to said opposite sides of said strips, a remaining cross sectional structure at each end of each blade extending from said median portion to an opposite one of said edges, said remaining cross sectional structure free relative to each of said strips.

3. In a blower wheel construction the combination of: an annular assembly of elongated blades spaced laterally with respect to each other and formed of a single sheet of metal, said blades all integral therewith; a pair of strip portions of said sheet metal spaced from each other and integral with opposite ends of said blades; opposite sides of said strip portions being common to respective opposite sides of said sheet; said blades having opposite edges disposed longitudinally thereof; cross sectional structure of each blade extending from one of its edges to the other edge thereof and being disposed generally at an angle to said sides of said strip portions; one of said edges being spaced laterally with respect to said strips at one respective side of each strip, the other of said edges being spaced laterally with respect to a respective opposite side of each of said strips; each blade being at each end thereof integral with said strips throughout its cross section structure from a median portion of the cross section structure to one of said edges; and offset structure of each blade extending from said last mentioned edge generally on an angle thereto and on an angle to one of the said sides of said strips, said offset structure, thus, forming an integral structural connection between said last mentioned edge and said strips and disposed angularly with relation thereto; folded portion of said strips disposed between adjacent ends of said blades; the planes of said folded portions being wholly disposed in substantially parallel relation to said opposite sides of said strips, a remaining cross sectional structure at each end of each blade extending from said median portion to an opposite one of said edges, said remaining cross sectional structure free relative to each of said strips; second offset structure of each blade near each end thereof at each of said remaining cross sectional structures, said second offset structure being offset laterally relative to the longitudinal axis of the respective blade, second offset structure, thus, longitudinally shortening each blade, whereby said strips at opposite ends of said blades are initially drawn closer together during the forming of said blades and, thus, said strips are located closer together than the respective portions of said sheet of material were before said blades were formed at said first and last mentioned offset portions.

4. In a blower wheel construction the combination of: an annular assembly of elongated blades spaced laterally with respect to each other and formed of a single sheet of metal, said blades all integral therewith; a pair of strip portions of said sheet metal spaced from each other and integral with opposite ends of said blades; opposite sides of said strip portions being common to respective opposite sides of said sheet; said blades having opposite edges disposed longitudinally thereof; cross sectional structure of each blade extending from one of its edges to the other edge thereof and being disposed generally at an angle to said sides of said strip portions; one of said edges being spaced laterally with respect to said strips at one respective side of each strip, the other of said edges being spaced laterally with respect to a respective opposite side of each of said strips; each blade being at each end thereof integral with said strips throughout its cross section structure from a median portion of the cross section structure to one of said edges; and offset structure of each blade extending from said last mentioned edge, generally on an angle there-

to and on an angle to one of the said sides of said strips, said offset structure, thus, forming an integral structural connection between said last mentioned edge and said strips and disposed angularly with relation thereto; folded portions of said strips disposed between adjacent ends of said blades; the planes of said folded portions being wholly disposed in substantially parallel relation to said sides of said strips.

5. In a blower wheel construction the combination of: an annular assembly of elongated blades spaced laterally with respect to each other and formed of a single sheet of metal, said blades all integral therewith; a pair of strip portions of said sheet metal spaced from each other and integral with opposite ends of said blades; opposite sides of said strip portions being common to respective opposite sides of said sheet; said blades having opposite edges disposed longitudinally thereof; cross sectional structure of each blade extending from one of its edges to the other edge thereof and being disposed generally at an angle to said sides of said strip portions; one of said edges being spaced laterally with respect to said strips at one respective side of each strip, the other of said edges being spaced laterally with respect to a respective opposite side of each of said strips; each blade being at each end thereof integral with said strips throughout its cross section structure from a median portion of the cross section structure to one of said edges; and offset structure of each blade extending from said last mentioned edge generally on an angle thereto and on an angle to one of the said sides of said strips, said offset structure, thus, forming an integral structural connection between said last mentioned edge and said strips and disposed angularly with relation thereto; folded portions of said strips disposed between adjacent ends of said blades; the planes of said folded portions being wholly disposed in substantially parallel relation to said sides of said strips, said blade assembly disposed on a hollow cylindrical form wherein said strips are disposed in a substantially circular row at each end of said hollow cylindrical form.

6. In a blower wheel construction the combination of: an annular assembly of elongated blades spaced laterally with respect to each other and formed of a single sheet of metal, said blades all integral therewith; a pair of strip portions of said sheet metal spaced from each other and integral with opposite ends of said blades; opposite sides of said strip portions being common to respective opposite sides of said sheet; said blades having opposite edges disposed longitudinally thereof; cross sectional structure of each blade extending from one of its edges to the other edge thereof and being disposed generally at an angle to said sides of said strip portions; one of said edges being spaced laterally with respect to said strips at one respective side of each strip, the other of said edges being spaced laterally with respect to a respective opposite side of each of said strips; each blade being at each end thereof integral with said strips throughout its cross section structure from a median portion of the cross section structure to one of said edges; and offset structure of each blade extending from said last mentioned edge generally on an angle thereto and on an angle to one of the said sides of said strips, said offset structure, thus, forming an integral structural connection between said last mentioned edge and said strips and disposed angularly with relation thereto; folded portions of said strips disposed between adjacent ends of said blades; the planes of said folded portions being wholly disposed in substantially parallel relation to said sides of said strips, said blade assembly disposed on a hollow cylindrical form wherein said strips are disposed in a substantially circular row at each end of said hollow cylindrical form; annular end members connected to said circular strips; and shaft engaging means centrally thereof.

7. In a blower wheel construction the combination of: an annular assembly of elongated blades spaced laterally with respect to each other and formed of a single sheet of metal, said blades all integral therewith; a pair of strip portions of said sheet metal spaced from each other and integral with opposite ends of said blades; opposite sides of said strip portions being common to respective opposite sides of said sheet; said blades having opposite edges disposed longitudinally thereof; cross sectional structure of each blade extending from one of its edges to the other edge thereof and being disposed generally at an angle to said sides of said strip portions; one of said edges being spaced laterally with respect to said strips at one respective side of each strip, the other of said edges being spaced laterally with respect to a respective opposite side of each of said strips; each blade being at each end thereof integral with said strips throughout its cross section structure from a median portion of the cross section structure to one of said edges; and offset structure of each blade extending from said last mentioned edge generally on an angle thereto and on an angle to one of the said sides of said strips, said offset structure, thus, forming an integral structural connection between said last mentioned edge and said strips and disposed angularly with relation thereto; folded portions of said strips disposed between adjacent ends of said blades; the planes of said folded portions being wholly disposed in substantially parallel relation to said sides of said strips, said blade assembly disposed on a hollow cylindrical form wherein said strips are disposed in a substantially circular row at each end of said hollow cylindrical form; annular end members connected to said circular strips; and shaft engaging means centrally thereof; annular channels on said end members and portions of said channels formed over said folded portions of said strips.

8. In a blower wheel construction the combination of: an annular assembly of elongated blades spaced laterally with respect to each other and formed of a single sheet of metal, said blades all integral therewith; a pair of strip portions of said sheet metal spaced from each other and integral with opposite ends of said blades; opposite sides of said strip portions being common to respective opposite sides of said sheet; said blades having opposite edges disposed longitudinally thereof; cross sectional structure of each blade extending from one of its edges to the other edge thereof and being disposed generally at an angle to said sides of said strip portions; one of said edges being spaced laterally with respect to said strips at one respective side of each strip, the other of said edges being spaced laterally with respect to a respective opposite side of each of said strips; each blade being at each end thereof integral with said strips throughout its cross section structure from a median portion of the cross section structure to one of said edges; and offset structure of each blade extending from said last mentioned edge generally on an angle thereto and on an angle to one of the said sides of said strips, said offset structure, thus, forming an integral structural connection between said last mentioned edge and said strips and disposed angularly with relation thereto; folded portions of said strips disposed between adjacent ends of said blades; said folded portions being disposed on sides of said strips facing said edge portions of said blades which are integral with and closest to said offset structure thereof.

9. In a blower wheel construction the combination of: an annular assembly of elongated blades spaced laterally with respect to each other and formed of a single sheet of metal, said blades all integral therewith; a pair of strip portions of said sheet metal spaced from each other and integral with opposite ends of said blades; opposite sides of said strip portions being common to respective opposite sides of said sheet; said blades having opposite edges disposed longitudinally thereof; cross sectional structure of each blade extending from one of its edges to the other edge thereof and being disposed generally at an angle to said sides of said strip portions; one of said edges being spaced laterally with respect to said strips at one respective side of each strip, the other of said edges being

spaced laterally with respect to a respective opposite side of each of said strips; each blade being at each end thereof integral with said strips throughout its cross section structure from a median portion of the cross section structure to one of said edges; and offset structure of each blade extending from said last mentioned edge generally on an angle thereto and on an angle to one of the said sides of said strips, said offset structure, thus, forming an integral structural connection between said last mentioned edge and said strips and disposed angularly with relation thereto; said cross sectional structure of each blade curved from said median location thereof to said edge of said blade closest to and integral with said offset structure.

10. In a blower wheel construction the combination of: an annular assembly of elongated blades spaced laterally with respect to each other and formed of a single sheet of metal; said blades all integral with each other; a pair of strip portions of said sheet metal spaced from each other and integral with opposite ends of said blades; flat folded portions of said strips disposed between adjacent ends of said blades; the planes of said folded portions being wholly disposed in substantially parallel relation to said sides of said strips, an annular channel structure, hub bearing means in connection therewith; said annular channel structure having an annular ledge; said folded portions of said strips supported on the outer side of said annular ledge; opposite portions of said channel structure disposed adjacent opposite edges of said folded portions, said channel structure looped over said folded portions and having an inner annular edge engaging said blades adjacent said folded portions; said annular edge of said channel structure being formed inwardly a slight distance beyond the normal plane of its engagement with said blades to deflect said blades inwardly toward the axis of said annular assembly and to thereby create resilient deflection of said blades, whereby normal spring back of the annular channel structure after forming is compensated for by normal spring back of said blades in the same direction to thereby maintain tension of said blades against said annular edge and to hold said folded portions securely engaged with said annular ledge portion.

11. In a blower wheel construction the combination of: an annular assembly of elongated blades spaced laterally with respect to each other and formed of a single sheet of metal; said blades all integral with each other; a pair of strip portions of said sheet metal spaced from each other and integral with opposite ends of said blades; flat folded portions of said strips disposed between adjacent ends of said blades; the planes of said folded portions being wholly disposed in substantially parallel relation to said sides of said strips, an annular channel structure, hub bearing means in connection therewith; said annular channel structure having an annular ledge; said folded portions of said strips supported on the outer side of said annular ledge; opposite portions of said channel structure disposed adjacent opposite edges of said folded portions, said channel structure looped over said folded portions and having an inner annular edge engaging said blades adjacent said folded portions; said annular edge of said channel structure being formed inwardly a slight distance beyond the normal plane of its engagement with said blades to deflect said blades inwardly toward the axis of said annular assembly and to thereby create resilient deflection of said blades, whereby normal spring back of the annular channel structure after forming is compensated for by normal spring back of said blades in the same direction to thereby maintain tension of said blades against said annular edge and to hold said folded portions securely engaged with said annular ledge portion; said annular channel structure being arched in cross section and substantially spaced from said folded portions to thereby provide resilient structure deflectable inwardly toward said annular edge.

12. A blower wheel construction method consisting of the forming of an annular assembly of elongated blades spaced laterally with respect to each other and formed of a single sheet of metal and forming folded portions of metal integral interconnecting adjacent ends of said blades, then supporting said folded portions on annular ledge outwardly of the annular ledge, then forming an annular arched channel structure around said folded portions while supported on said ledge and forming an annular edge of said channel structure inwardly adjacent and against said blades to thereby deflect said blades inwardly in a direction toward said ledge and then releasing said channel structure permitting normal spring back of the annular edge thereof and permitting reaction spring back of said blades following their initial deflection inwardly by said annular ledge to thereby maintain tension between said blades and said annular edge for maintaining the assembly of said annular channel structures securely relative to said annular assembly of blades.

References Cited by the Examiner

UNITED STATES PATENTS

1,892,930	1/1933	Burman	230—134.5
2,242,586	5/1941	Marbach	230—134.5
2,684,521	7/1954	Morrison	230—134.5
2,833,464	5/1958	Sharp	230—134.5
2,932,446	4/1960	Zaro	230—134.5

SAMUEL LEVINE, *Primary Examiner.*

HENRY F. RADUAZO, *Examiner.*