May 28, 1963 V. N. DELANEY 3,091,384

BLOWER WHEEL BLADE CONSTRUCTION AND METHOD OF ASSEMBLY

Filed March 17, 1960 2 Sheets-Sheet 1

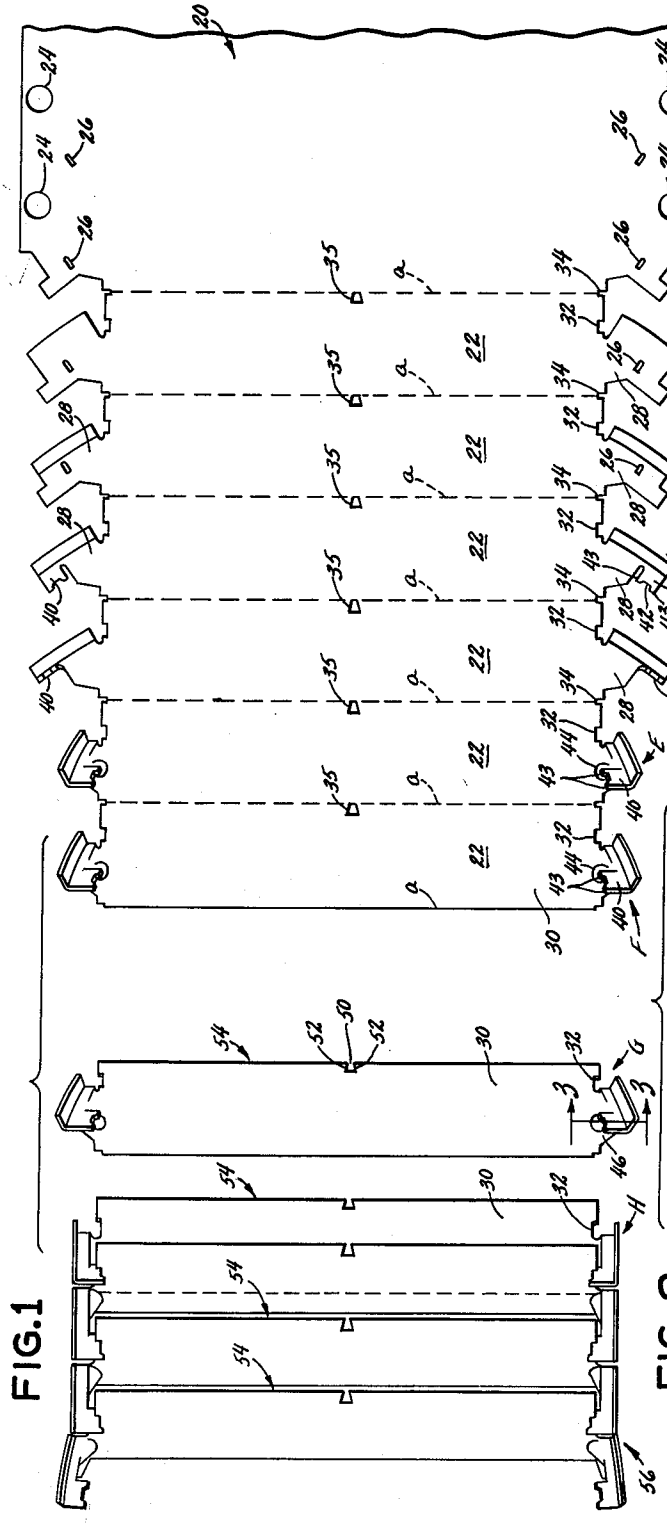


FIG. 1

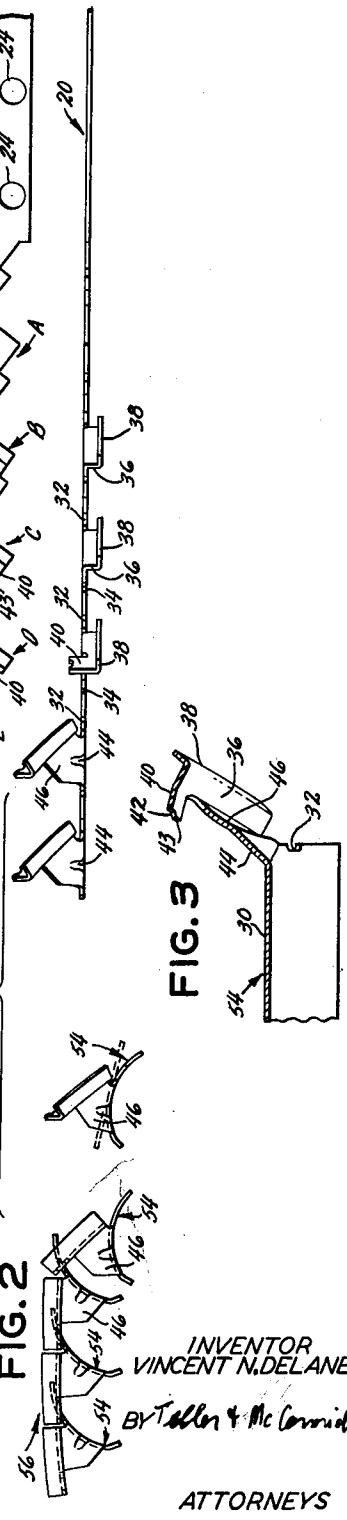


FIG. 2

FIG. 3

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BLOWER WHEEL BLADE CONSTRUCTION AND METHOD OF ASSEMBLY

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FIG.4

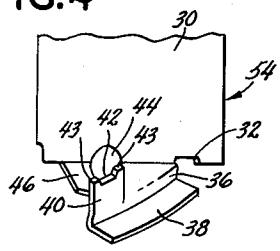


FIG.5

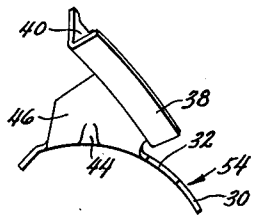


FIG. 6

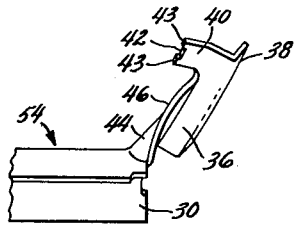


FIG.7

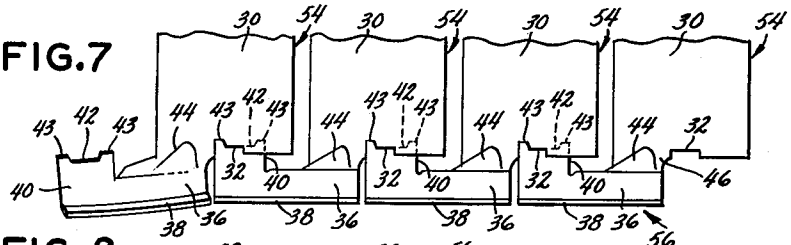


FIG.8

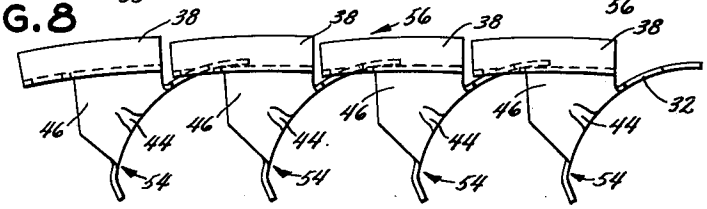


FIG.9

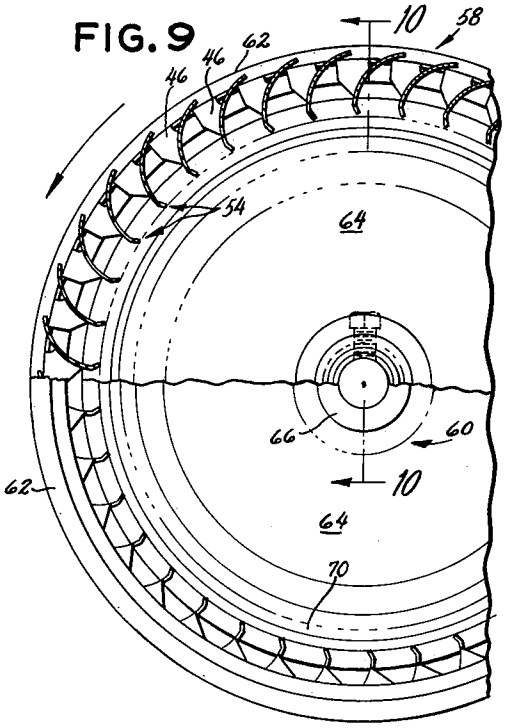
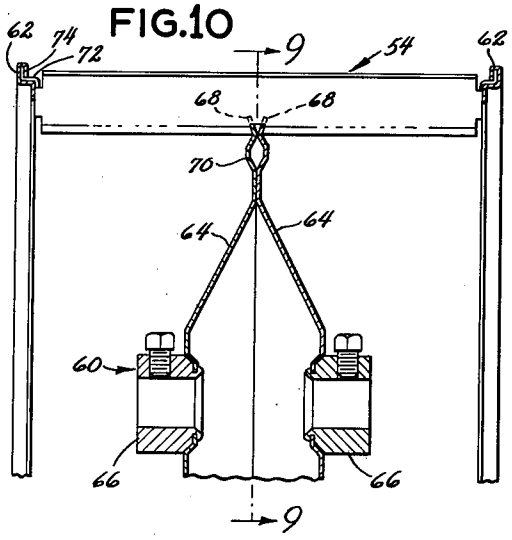


FIG.10



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3,091,384

BLOWER WHEEL BLADE CONSTRUCTION AND METHOD OF ASSEMBLY

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Filed Mar. 17, 1960, Ser. No. 15,688
12 Claims. (Cl. 230—134)

This invention relates to blower wheels of the type having an annular series of longitudinal air moving blades, and deals more particularly with a blade construction and method of assembly whereby the individual blades are interlinked to form a chain of blades requiring only the addition of support members to complete the blower wheel.

The general object of this invention is to provide an improved blower wheel construction and method of assembly which substantially reduce the time and labor required to make a complete blower wheel by eliminating the usual necessity of separately fastening each blade to the blade supporting members.

A more specific object of this invention is to provide a blower wheel construction employing blades that may be rapidly formed from a strip of sheet material and linked together in a multi-station press to provide a flexible chain of blades requiring only the addition of support members to complete the wheel.

Another object of this invention is to provide a method of forming a chain of interlinked blades from a strip of sheet material, the steps of which method, including the interlinking of the blades, may be readily carried out in a multi-station press so as to require no hand operation.

Further objects and advantages will be apparent from the drawings and the following description and claims.

The drawings show in detail the preferred embodiment of the invention and such embodiment will be described, but it will be understood that various changes may be made from the construction and method shown, and that the description and drawings are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Of the drawings:

FIG. 1 is a plan view of a sheet of material illustrating the various operations performed thereon in accordance with this invention to produce a chain of interlinked blades,

FIG. 2 is an end view of the sheet material shown in FIG. 1,

FIG. 3 is a vertical sectional view taken on the line 3—3 of FIG. 1,

FIG. 4 is an enlarged plan view of the end portion of a blade made by the process shown in FIG. 1,

FIG. 5 is an end view of the blade portion shown in FIG. 4,

FIG. 6 is a side view of the blade portion shown in FIG. 4,

FIG. 7 is an enlarged plan view showing the ends of several interlinked blades made by the process shown in FIG. 1,

FIG. 8 is an end view of the blades shown in FIG. 7,

FIG. 9 is a partial end view of a blower wheel employing blades made in accordance with this invention, and

FIG. 10 is a vertical sectional view taken on the line 10—10 of FIG. 9.

In practicing the method of this invention, it is preferred, but not essential, that the blades be formed, as shown in FIGS. 1 and 2, from a strip of sheet material 20 which is cut at one point in the blade forming process along the transverse lines *a*, *a* to separate the blades from the strip. The lines *a*, *a* thus divide the strip 20 into rectangular blanks 22, 22 from each of which blanks a single blade is made. The blanks, of course, are integrally connected one to another in the strip, and the dividing lines *a*, *a* are imaginary or invisible until such time as the blanks are sheared from the strip. The steps involved in making blades from the strip 20 are best carried out in a multi-station press equipped with various metal forming and cutting dies, and the method will be described as though carried out by the use of such a press. It will be understood, however, that the invention is not limited to the use of a press and that the invention may be practiced by the use of other conventional metal forming tools.

Referring to FIGS. 1 and 2, the metal strip 20 is fed into the press (not shown) where it is first pierced to provide holes 24, 24 and slits 26, 26 along each edge of the strip, the holes 24 and the slits 26 being formed at regularly spaced intervals so that one hole and one slit are located at each end of each rectangular blank 22. The holes 24, 24 form no part of the completed blades, but serve as piloting holes for positively locating the strip 20 in the press and for maintaining a uniform spacing between the lines *a*, *a*. That is, the holes 24, 24 receive pilot members of the press which hold the strip 20 during the press cycles and accurately locate it relative to the press stations. In the description which follows, the stations at which the succeeding operations are performed on the strip 20 are indicated generally in FIGS. 1 and 2 by the letters A to H inclusive. Between cycles of the press the strip is advanced to the left a distance equal to the spacing between the lines *a*, *a* so as to move each blank 22 progressively through the stations A to H. The sequence of operations performed on each blank 22 may therefore be described by taking up in sequence the stations A to H and considering the operations performed at each. This form of description will be followed below, and to simplify the same it will be assumed that the same blank 22 is operated upon at each station.

At the station A which follows the piercing operation described above, portions of each end of the rectangular blank 22 are cut away by a blanking die to produce end shapes 28, 28, leaving between the end shapes 28, 28 a solid middle portion or body 30 which later becomes the body of the finished blade. The blanking operation which produces the end shapes 28, 28 also produces a notch 32 in each end of the body 30, and smaller notches 34, 34 adjacent the lines *a*, *a* along which the sheet 20 is later cut. In addition, the center of the strip 20 may be pierced at the station A to provide a trapezoidal opening 35 adjacent the middle of each dividing line *a*. This opening, as will later be described, provides a notch in each finished blade for fastening the blade to the particular hub structure disclosed herein. For different hub structures, however, the opening 35 may be of a different shape than that shown, or may be omitted entirely. Also, the piercing operation which provides the opening 35 need not be performed at the station A, but may be performed at another succeeding station if desired.

At the next station of the press, indicated at B, each of the end shapes 28, 28 of the blank 22 is bent adjacent its rear portion at 90° angles along two bend lines to produce an offset portion 36 and a foot portion 38. The offset portion 36, as seen best in FIG. 2, extends perpendicularly, and in this case downwardly, from the plane of the sheet 20 while the foot portion 38, which is formed along the lower edge of the offset portion, is parallel to the sheet 20. The lines along which the bending occurs in this operation are preferably slightly arcuate so that the resulting offset and foot portions will also be slightly arcuate in shape. As will be evident later, the degree of arcuate curvature of the offset and foot portions depends

on the size of wheel in which the blades are used. In the completed wheel the offset and foot portions of the several blades collectively define annuli at the ends of the wheel, and therefore, these portions should preferably have radii of curvature substantially equal to the radii of these annuli.

After the bending operation at station B, which forms an offset portion **36** and a foot portion **38** on each end shape **28**, the end shapes are trimmed adjacent the forward sides thereof by a further cutting or blanking operation, at the station C, to define tab portions **40**, **40** each having a notch **42** in its forward edge, with the sides of the notch being defined by two spaced and outwardly projecting fingers **43**, **43**. The slits **26**, **26** are elongated in this operation and define the inner side edges of the tab portions **40**, **40**. The tab portions **40**, **40** are then, at station D, bent 90° in the opposite direction from the offset portions **36**, **36** so as to extend perpendicularly, and in this case upwardly, from the plane of the sheet **20**, with each tab portion being disposed in substantially the same plane as its associated offset portion **36**.

Next, at the station indicated at E, each of the end shapes **28** of the blank **22** are bent upwardly from the plane of the blank or sheet material **20** along a bend line adjacent the end of the body **30**. During this operation a gusset **44** is, or may be, formed between each end shape and the body by pressing the sheet material inwardly along a line at right angles to the bend line between the body and the end shape. The bending of the end shapes relative to the body **30** brings the tab portions **40**, **40** to positions whereat the notches **42**, **42** therein face generally inwardly toward one another. The end shapes in this operation are preferably each bent by an angle somewhat less than 90° so as to diverge outwardly from the ends of the associated body **30**. The tabs **40**, **40** are of such length that after the bending of the end shapes, the ends of the fingers **43**, **43** on the opposed tabs are spaced apart by a distance greater than the distance between the bases of the opposed notches **32**, **32** in the body **30**. The particular angle to which the end shapes **28**, **28** are bent is not critical so long as the spacing between the ends of the opposed fingers **43**, **43** is greater than the spacing between the body notches **32**, **32**. It is preferred to bend each end shape of the blade by an equal angle, as shown and described, but this is not necessary. One of the end shapes may, for example, be bent to a 90° angle relative to the body **30** and the other end shape bent to an angle substantially less than 90° provided the required spacing between the tabs is maintained in so doing. Also, at this point in the blade-forming process the end shapes **28**, **28** of the blank lose their character as such and become, and will be referred to hereafter as flanges **46**, **46**, each having on its outer end an offset portion **36**, a foot portion **38**, and a tab **40**.

After being operated on at station E, the sheet material **20** is cut or lanced along the transverse line *a*, at station F, to separate the blank **22** from the sheet. As a result of this shearing operation, the respective openings **35** define notches **50** midway between the ends of the corresponding separated blank, each notch **50** being located in the right-hand edge of the blank, as shown in FIG. 1, and having inwardly diverging edges **52**, **52**. After the blank is cut from the sheet at F, it is transferred to the station G where the body portion **30** of the blank, which is flat up to this point, as shown by the broken lines at station G in FIG. 2, is bent or shaped to form an arcuate cross-section, as shown by the solid lines at station G in FIG. 2, and to convert the blank into a finished blade **54**.

The construction of the finished blade **54**, after the shaping operation at the station G, is best shown in the enlarged views of FIGS. 3 to 6, inclusive, and will be summarized below. As shown in these figures, the blade **54** includes a longitudinal body **30** which is arcuate in transverse cross-section. At each end of the body **30** is a flange **46** which extends upwardly from the body and which diverges somewhat outwardly from the end thereof, as shown best in FIG. 6. A gusset **44** is formed between the flange **46** and the body **30** to strengthen the bend between the latter two members. On the outer part of each flange **46** is an offset portion **36** which extends generally outwardly from the end of the body **30**, a foot portion **38** which extends generally upwardly from the outer edge of the offset portion, and a tab **40** which extends generally inwardly toward the body **30**. The tab **40** includes two inwardly directed fingers **43**, **43** which are spaced apart and define a notch **42** in the inner end of the tab. Rearwardly, or to the right of the flange **46**, as viewed in FIGS. 4 and 5, the blade **54** has a notch **32** formed in the end of the body **30**, which notch opens axially outwardly, as shown in FIG. 4.

Each finished blade **54** produced at the station G is thereafter connected to the next preceding blade to produce a flexible chain of interlinked blades. This is, or may be, accomplished as shown in FIGS. 1 and 2 by transferring the finished blade **54** from the station G to the station H and positioning it at the latter station so that the inwardly opening notches **42**, **42** in the opposed tabs **40**, **40** thereof straddle the outwardly opening notches **32**, **32** in the next preceding blade **54**. Then at least one of the flanges **46**, **46** of the finished blade is bent inwardly a further distance toward the body **30** to decrease the spacing between the tabs **40**, **40** and to thereby bring the tab notches **42**, **42** into interfitting relationship with the body notches of the preceding blade and in which relationship the spaced fingers **43**, **43** of each tab lie on opposite sides of the body of the preceding blade and the bases of the tab notches are substantially in engagement with the corresponding bases of the body notches. The finished blade is thus free to pivot to a limited extent about the axis of its tab notches, but is restrained against axial and lateral movement, as will be evident from FIGS. 1 and 2. As mentioned previously, it is preferred that the flanges **46**, **46**, prior to the bending operation at station H, diverge outwardly from the ends of he body **30** by substantially equal angles; and it is further preferred, as shown in FIGS. 1 and 2, that at the station H the two flanges **46**, **46** each be bent substantially the same additional amount and that the final angle between each flange and its body be approximately 90°, although this is not essential to the broader aspects of the invention.

A chain of several interlinked blades **54**, **54**, as they leave the press, is shown at the left of FIGS. 1 and 2 and indicated in general by the reference numeral **56**. At the station H each finished blade **54** is in turn connected to the last blade in the chain **56**, the finished blade then becoming the last blade in the chain to which the next finished blade is connected. After each new blade is added to the chain the latter is advanced forward, or to the left, to make room for the next blade to be added. The chain of interlinked blades which thus emerges from the press may thereafter be broken into usable lengths by counting off a desired number of blades and then spreading apart one or both of the tabs of the proper blade to free the preceding blade. This operation may be done by hand, but is preferably accomplished by a suitable counting and spreading mechanism located at the discharge end of the press. Alternatively, the chain **56** could also be divided into usable lengths by omitting the bending operation on one blade at the station H after the desired number of blades have passed this station and been joined together.

The structure of a length of chain **56** made in accordance with this invention is shown in more detail in the enlarged views of FIGS. 7 and 8. The individual blades **54**, **54** are arranged with their longitudinal axes parallel and with their corresponding ends aligned in a common plane. The blades are interconnected by the interfitting

relationship between the body notches **32, 32** of one blade and the tab notches **42, 42** of the adjacent blade on the right. The two fingers of each tab **40** are disposed on opposite sides of the associated blade body, and the base of each tab notch **42** engages, or substantially engages, the base of the associated body notch **32** so that the blades are restrained against relative displacement other than a limited pivotal movement about the axis of the notches. This limited pivotal movement between adjacent blades makes the chain flexible so that if a sufficient number of blades are in a given length of chain the latter may be closed upon itself and made into a continuous annular member by positioning the body notches **32, 32** of the last blade between the spread apart tab notches **42, 42** of the first blade and then bending the flanges **46, 46** of the first blade inwardly to connect the blades. This step, however, is usually not performed until the chain is first positioned around a suitable hub structure, as described below.

A blower wheel **58** employing a series of interlinked blades **54, 54** as described above is shown in FIGS. 9 and 10. In addition to the blades, the wheel **58** includes a hub structure **60** and two end rings **62, 62**. Both the hub structure and the two end rings shown in these figures are similar to the corresponding structures shown in the application of Kenneth A. Merz, Serial No. 548,166, filed November 21, 1955, now Patent No. 3,004,326, to which reference is made for a detailed description of these elements and the method in which the blades are fastened to the hub structure. It should be understood, however, that the structure illustrated herein for supporting the blades is exemplary only and that other structures which serve to support the blades as a rigid unit adapted for rotation about a central axis may be employed.

Briefly, the hub structure includes two annular discs **64, 64** each having its inner portion connected to a hub member **66**, an outer peripheral portion **68**, and an annular bead **70** adjacent and spaced inwardly from the peripheral portion. In making the wheel **58** a length of chain **56** having the proper number of blades **54, 54** is positioned around the periphery of the hub structure, as shown in FIG. 9, with the longitudinal axes of the blades parallel to the central axis of the hub structure about which the hub members **66, 66** rotate. In positioning the chain of blades around the hub structure, the peripheral portions **68, 68** of the discs **64, 64** are entered into the notches **50, 50** of the blades. Thereafter, the peripheral portions **68, 68** are bent outwardly into engagement with the side edges **52, 52** of the notches **50, 50**, as shown in FIG. 10, to connect each blade in fixed relationship to the hub structure, by pressing together the two beads **70, 70**.

As shown in FIG. 9, the blades **54, 54**, after their attachment to the hub structure, form an annular series around the hub axis with the opposite ends of the blades disposed respectively in two axially spaced planes, FIG. 10. The flange **46** on each end of each blade **54** extends radially outwardly from the blade and forwardly toward the next adjacent blade and the interlinked connection between adjacent blades prevents each blade from moving axially or circumferentially. The offset portion **36** and the foot portion **38** on each flange are preferably of such circumferential length and so oriented that, as shown in FIG. 9, the individual offset and foot portions at each end of the wheel **58** collectively define a substantially continuous offset annulus **72** and a substantially continuous foot annulus **74** at each end of the wheel to which annuli the end rings **62, 62** may be attached, as shown in FIG. 9, by a spinning operation. The end rings **62, 62** maintain the ends of the blades in the rigid annular relationship shown and together with the hub structure **60** form the blades into a completed wheel.

In FIG. 9 the preferred direction of rotation for the illustrated blower wheel is shown, as indicated by the arrow, to be in the counterclockwise sense, and in the above description and the claims the terms "forward" and "rearward" have been used with this direction of rotation in mind, although in actual use the blower wheel may in some instances be rotated in the opposite direction.

The invention claimed is:

1. A blower wheel of the centrifugal type comprising, a hub structure rotatable about a central axis, a plurality of longitudinal air moving blades rotatable with said hub structure, said blades being arranged in an annular series about said hub structure with the longitudinal axes thereof generally parallel to said central axis and with the opposite ends of said blades disposed respectively in two axially spaced radial planes, a flange on each end of each blade extending forwardly and radially outwardly with respect to the associated blade, means defining an axially outwardly opening notch in each end of each blade rearwardly of the associated flange, and an axially inwardly directed tab on the forward portion of each of said flanges, each of said tabs having an axially inwardly opening notch in the inner end thereof which engages in interfitting relationship the notch in the corresponding end of the next adjacent blade to link together adjacent blades and prevent relative circumferential and axial displacement therebetween.

2. A blower wheel of the centrifugal type comprising, a hub structure rotatable around a central axis, a plurality of longitudinal air moving blades rotatable with said hub structure, said blades being arranged in an annular series about said hub structure with the longitudinal axes thereof generally parallel to said central axis and with the opposite ends of said blades disposed respectively in two axially spaced radial planes, a flange on each end of each blade extending forwardly and radially outwardly with respect to the associated blade, means defining an axially outwardly opening notch in each end of each blade rearwardly of the associated flange, and an axially inwardly directed tab on the forward portion of each of said flanges, each of said tabs having two axially inwardly directed and circumferentially spaced fingers on the inner end thereof and an axially inwardly opening notch defined between the two said fingers, the notch of each tab being interfitted with the notch in the corresponding end of the next adjacent blade with the two fingers of the tab being disposed on opposite sides of the blade and extending axially inwardly beyond the base of the blade end notch to engage the blade and prevent circumferential movement thereof relative to the tab.

3. A blower wheel of the centrifugal type comprising, a hub structure rotatable about a central axis, a plurality of longitudinal air moving blades rotatable with said hub structure, said blades being arranged in an annular series about said hub structure with the longitudinal axes thereof generally parallel to said central axis and with the opposite ends of said blades disposed respectively in two axially spaced radial planes, a flange on each end of each blade extending forwardly and radially outwardly with respect to the associated blade, means defining an axially outwardly opening notch in each end of each blade rearwardly of the associated flange, a circumferentially elongated offset portion on each of said flanges and extending axially outwardly therefrom, a tab extending axially inwardly from the forward end of each of said offset portions, each of said tabs having an axially inwardly opening notch in the inner end thereof which engages in interfitting relationship the notch in the corresponding end of the next adjacent blade to link together adjacent blades and prevent relative circumferential and axial displacement therebetween, a radially outwardly extending foot portion formed along the outer edge of each of said offset portions, said offset and said foot portions being of such length and so oriented as to collectively define substantially continuous offset and foot annuli at each end of said blower wheel, and a ring at each end of said blower wheel connected to the annuli defined by the cor-

responding offset and foot portions to hold said latter portions in their annular relationship.

4. A chain of interlinked blades for use in fabricating a blower wheel of the centrifugal type, said chain comprising a plurality of elongated blades of arcuate cross-section arranged in laterally spaced relationship with their longitudinal axes parallel, each of said blades having an axially outwardly opening notch in each end thereof intermediate its side edges, a flange on each end of each blade extending away from the associated blade in a plane generally perpendicular to the longitudinal axis thereof, and a tab carried by each of said flanges and having an axially inwardly opening notch therein, the notches in the two tabs of each blade engaging respectively the notches in the two ends of the next adjacent blade to link together the adjacent blades.

5. A chain of interlinked blades for use in fabricating a blower wheel of the centrifugal type, said chain comprising a plurality of elongated blades of arcuate cross-section arranged in laterally spaced relation with their longitudinal axes parallel, each of said blades having an axially outwardly opening notch in each end thereof intermediate its side edges, a flange on each end of each blade extending away from the associated blade in a plane generally perpendicular to the longitudinal axis thereof, each of said flanges carrying an offset portion extending axially outwardly therefrom and a foot portion formed along the outer edge of said offset portion, said offset and foot portions being elongated and arcuate in a plane perpendicular to the longitudinal axis of the associated blade, and a tab carried by each of said flanges and having an axially inwardly opening notch therein, the notches in the two ends of each blade interfitting respectively with the notches in the two ends of the next adjacent blade to pivotally link together the adjacent blades.

6. A chain of interlinked blades for use in fabricating a blower wheel of the centrifugal type, said chain comprising a plurality of blades, each of said blades having a body portion of arcuate cross-section and a pair of flanges extending one from each end of said body portion, said body portion having a pair of axially outwardly opening notches therein located one on each end of said body portion and said flanges each having an inwardly directed tab with an inwardly opening notch therein, all except the first of said blades having the flanges thereof disposed in planes substantially perpendicular to the body portion of said blades with the tabs of one blade receiving the body portion of the next adjacent blade and with the notches of the tabs being interfitted with the notches of the body portion to pivotally connect the blades, the flanges of said first blade diverging outwardly from the body portion thereof so as to be capable of receiving the body portion of another blade between its tabs without interference.

7. The method of producing interlinked blades for use in fabricating a blower wheel of the centrifugal type, which method comprises the steps of cutting away portions of both ends of a rectangular blank of sheet material to leave a body portion having a notch in each end thereof and an end shape connected to each end of the body portion with each end shape including a tab portion having a notch therein, bending the tab portion of each end shape in one direction so as to extend away from the plane of said body portion, bending each end shape in said one direction along a transverse line adjacent the associated end of said body portion, and, during said latter bending operation, positioning said end shapes in such relation to the body portion of another blade that the notches in the tabs of the end shapes being bent enter and interfit with notches in the respective ends of the body portion of said other blade.

8. The method of producing interlinked blades for use in fabricating a blower wheel of the centrifugal type, which method comprises the steps of cutting away portions of both ends of a rectangular blank of sheet material to leave a body portion having a notch in each end thereof and an end shape connected to each end of the body portion with each end shape including a tab portion having a notch therein, bending the tab portion of each end shape so as to extend downwardly from the plane of said blade body portion, bending each end shape downwardly along a transverse bend line adjacent the associated end of said body portion by an angle not more than approximately 90° and with at least one of said end shapes being bent by an angle substantially less than 90°, positioning said blank adjacent another blade having notches in each end of its body portion, and bending each end shape previously bent to an angle of less than 90° to approximately a full 90° to bring the notches of said tabs into interfitting engagement with the notches in the body portion of said other blade.

9. The method for making a chain of interlinked blades for use in fabricating a blower wheel of the centrifugal type, which method comprises the steps of providing a first longitudinal air moving blade having an outwardly opening notch in each end of its body and a flange on each end of its body bent away from the body along a transverse bend line, each of said flanges having a tab on the outer end thereof formed with a generally inwardly opening notch in its inner end, providing a second blade similar to said first blade, and having the inner ends of the tabs on the opposite ends thereof spaced further apart than the spacing between the notches in the body of said first blade, positioning the tab notches of said second blade in straddling relationship with the body notches of said first blade, bending at least one of the flanges on said second blade a further distance inwardly along its transverse bend line to decrease the spacing between the opposed tabs and bring the tab notches of said second blade into interlinking relationship with the body notches of said first blade, providing subsequent blades similar to said second blade, and individually connecting each subsequent blade to the next preceding blade by the same steps as employed in connecting said second blade to said first blade.

10. The method for making a continuous chain of interlinked blades for use in fabricating a blower wheel of the centrifugal type, which method comprises the steps of providing a first longitudinal air moving blade having an outwardly opening notch in each end of its body and a flange on each end of its body bent away from the body along a transverse bend line, each of said flanges having a tab on the outer end thereof formed with a generally inwardly opening notch in its inner end, providing a second blade similar to said first blade, positioning the tab notches of said second blade in straddling relationship with the body notches of said first blade, bending at least one of the flanges on said second blade a further distance inwardly along its transverse bend line to decrease the spacing between the opposed tabs and bring the tab notches into interlinking relationship with the body notches of said first blade, providing a given number of subsequent blades similar to said first blade, individually connecting each subsequent blade to the next preceding blade by the same steps as employed in connecting said second blade to said first blade to provide a length of interlinked blades, closing said length of interlinked blades upon itself by positioning the body notches of the last of said subsequent blades between the tab notches of said first blade, and bending at least one of the flanges on said first blade a further distance inwardly along its transverse bend line to decrease the spacing between the opposed tabs and bring the tab notches into interlinking relationship with the body notches of said last blade.

11. The method for making a blower wheel of the centrifugal type, which method comprises the steps of providing a first longitudinal air moving blade having an outwardly opening notch in each end of its body and a

flange on each end of its body bent away from the body along a transverse bend line, each of said flanges having a tab on the outer end thereof formed with a generally inwardly opening notch in its inner end, providing a second blade similar to said first blade, positioning the tab notches of said second blade in straddling relationship with the body notches of said first blade, bending at least one of the flanges on said second blade a further distance inwardly along its transverse bend line to decrease the spacing between the opposed tabs and bring the tab notches into interlinking relationship with the body notches of said first blade, providing subsequent blades similar to said first blade, individually connecting each subsequent blade to the next preceding blade by the same steps as employed in connecting said second blade to said first blade to provide a length of interlinked blades, providing an annular hub structure rotatable about a central axis, positioning said length of interlinked blades around the periphery of said hub structure with the longitudinal axes of said blades parallel to said central hub axis, connecting the last blade of said length of interlinked blades to said first blade by the same steps as employed in connecting second blade to said first blade, and connecting each blade in fixed relationship to the hub structure.

12. The method for making a blower wheel of the

centrifugal type, which method comprises the steps of providing a chain of interlinked blades having elongated arcuate foot portions extending generally outwardly from the ends thereof and elongated arcuate offset portions each located on the outer edge of a respective one of said foot portions and extending generally perpendicular thereto, closing said chain upon itself by positioning the first blade of said chain adjacent the last blade of said chain, arranging said closed chain into a substantially circular form so that the elongated offset and foot portions of said blades collectively define substantially continuous annuli on the ends of said chain with the foot portions of each end of said chain being located in a common plane, and attaching an end ring to each end of said chain in such a manner that the ring engages both the annulus formed by the associated offset portions and the annulus formed by the associated foot portions to hold said foot portions in their annular relationship and to hold said offset portions in said common plane.

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