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3,224,078

METHOD OF MAKING A TURBINE TYPE BLOWER WHEEL

Filed Sept. 30, 1963

2 Sheets-Sheet 1

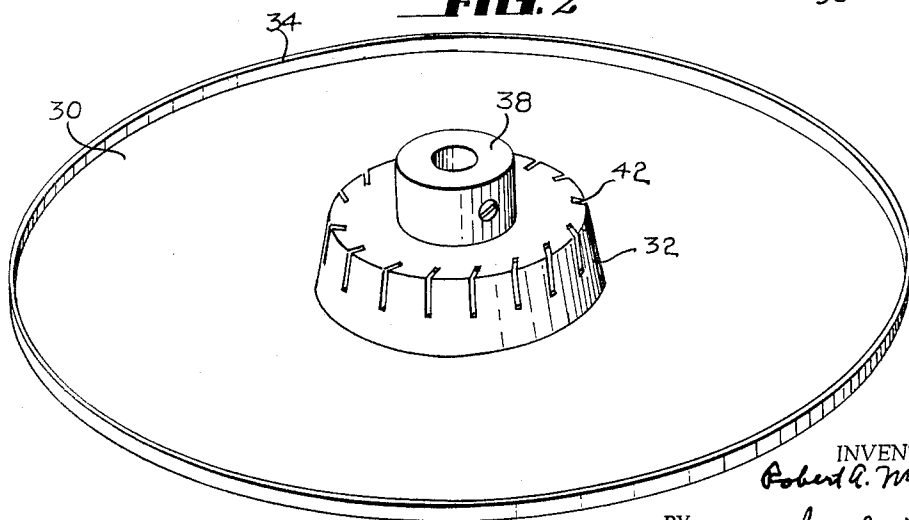
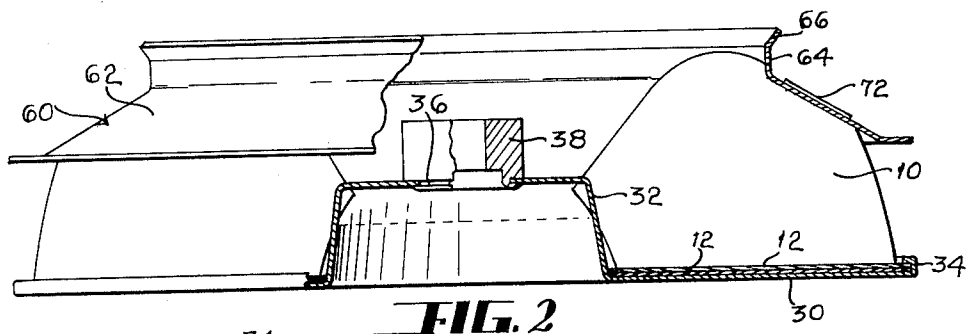
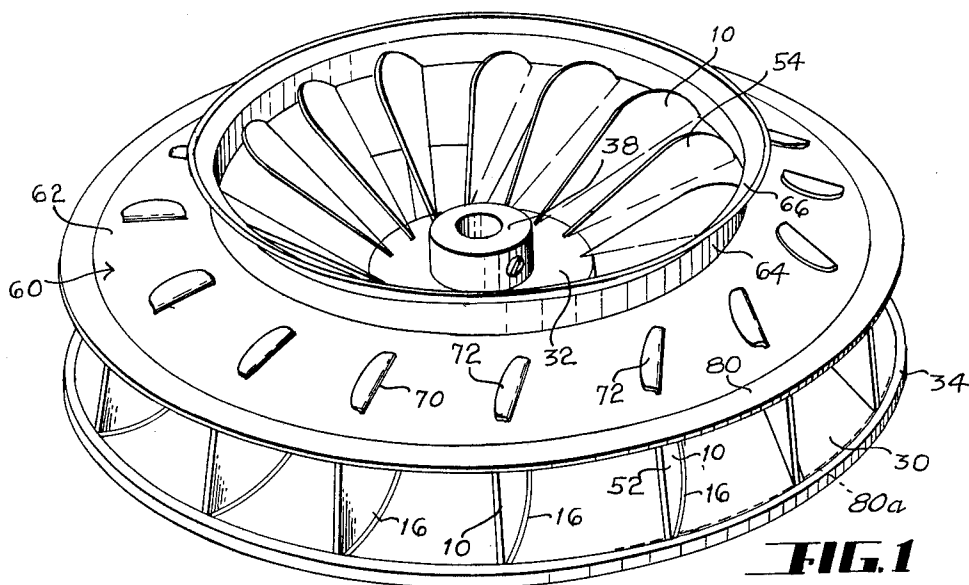


FIG. 3

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2 Sheets-Sheet 2

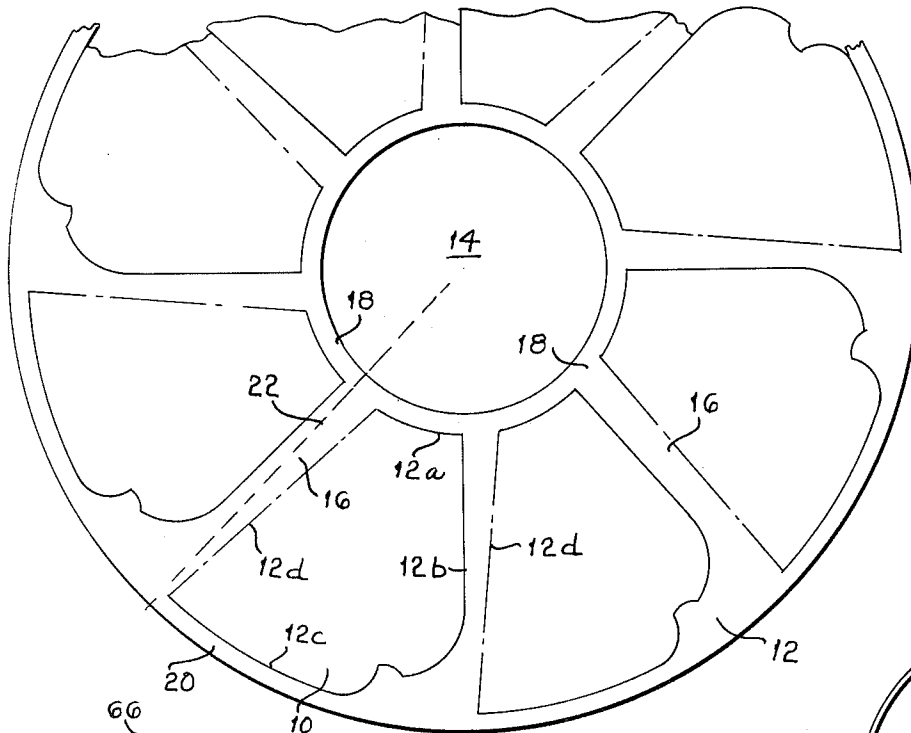


FIG. 4

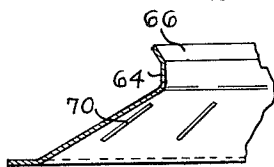


FIG. 6

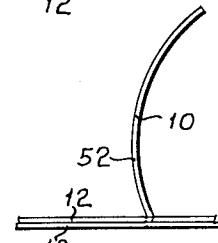


FIG. 7

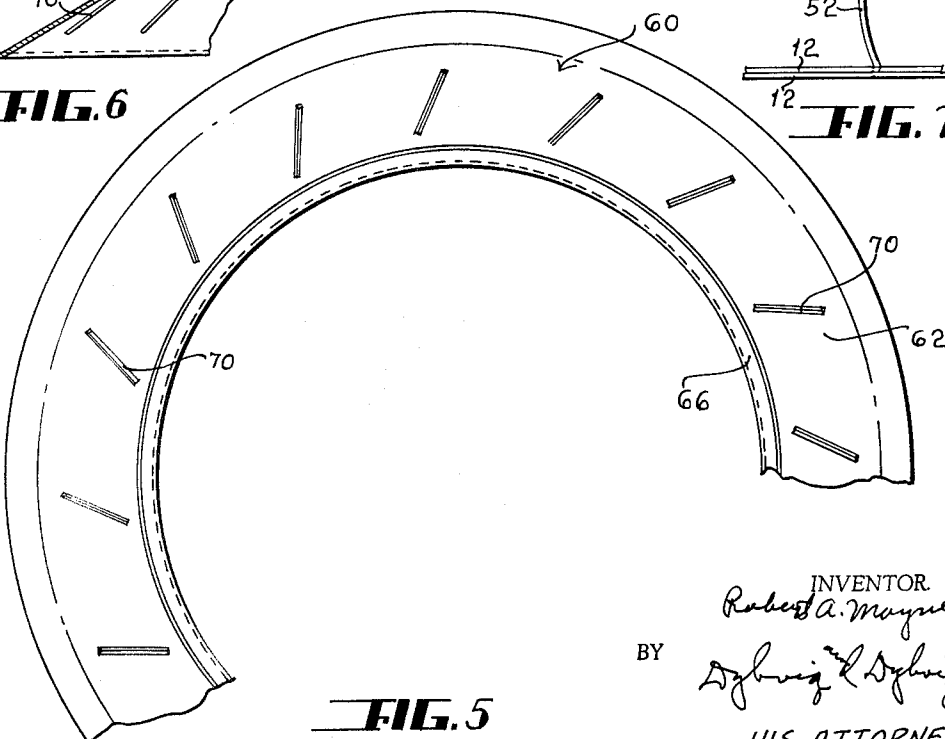


FIG. 5

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3,224,078 METHOD OF MAKING A TURBINE TYPE BLOWER WHEEL

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7 Claims. (Cl. 29—156.8)

This invention relates to method of making a turbine type radial blower wheel wherein the blower wheel is made from sheet metal members.

This application is a continuation-in-part of application Serial No. 24,035, filed April 22, 1960, for Turbine Type Radial Blower Wheel.

An object of this invention is to provide a blower wheel of the turbine type wherein the blades are integral with either one or two marginal ring portions. If two rings are used, one ring is located at the inner ends of the blades and the other ring is located at the outer ends of the blades. If only one marginal ring portion is used, the marginal ring may be secured to either the inner or the outer ends of the blades. Two or more of these sheet metal blade members are superimposed upon each other with the blades equally spaced. The sheet metal members provided with blades are supported upon a disc having a frustum conical center portion and a marginal flange, the bladed members being nested within the marginal flange. A frustum conical member is positioned and fixedly attached to the blade portions opposite the marginal rings, so that as the assembly is rotated, the frustum conical member, the blades and the frustum conical supporting member cooperate to form radial air passages or channels.

Other objects and advantages reside in the construction of parts, the combination thereof, the method of manufacture and the mode of operation, as will become more apparent from the following description.

In the drawings: FIGURE 1 is a perspective view illustrating a turbine type radial blower wheel.

FIGURE 2 is a side elevational view, with parts broken away and shown in section.

FIGURE 3 is a perspective top plan view of a base member used in supporting the blower wheel assembly.

FIGURE 4 is a plan view of a stamping showing the blades several along three sides thereof.

FIGURE 5 is a fragmentary plan view of the frustum conical member shown in FIGURE 1.

FIGURE 6 is a cross sectional view of a frustum conical member.

FIGURE 7 discloses a step in forming a blade projected from its disc or sheet member.

The radial blower is made from sheet metal, with the exception of the hub. Referring to FIGURE 4, the blades 10 are stamped from a sheet metal member 12 that is circular and provided with a center opening 14. The sides 12a, 12b, and 12c of the blade 10 are severed from the sheet metal member by a stamping operation. The side 12d is integral with a spoke-like portion 16 that extends from the inner rim or margin 18 to the outer rim or margin 20. The spoke-like member 16 tapers outwardly, in that the full line 12d forms a 5° angle with respect to the radii 22. Thus, it can be seen that the blade forms a slight angle with respect to the radius of the blower wheel.

The shape of the blade, as viewed from one side, is clearly shown in FIGURE 4. As clearly shown in FIGURES 1 and 4, the radial length of each blade is greater than the axial width of the blade. In FIGURE 7, the blade, as viewed from one end thereof, has been struck

out from the plane of the sheet metal member 12. The blade 10 is shown in a generally right angular direction from the plane of the sheet metal member 12. It is to be noted that the curvature of the blade is uniform, so that the blade lies in a cylindrical surface. The radius of curvature used in this particular illustration is about 1.7". However, that is a matter of choice. In a later step the curvature of a portion of the blades will be increased, as will be described more fully later. However, to permit the two pieces to be nested together, it is preferable to only partially curve the blades initially, as shown in FIGURE 7. All of the blades of each of the blanks used are curved and struck out from the plane of the sheet metal member, as shown in FIGURE 7.

If, for example, sixteen blades are used in a blower wheel, eight blades are struck from one sheet metal member 12 and another eight blades are struck from an identical sheet metal member. The two sheet metal members are superimposed upon each other, with the blades of one member being equally spaced between adjacent blades of the other member, so that alternate blades are formed from one of the sheet metal members and the other blades are formed from the other sheet metal member.

In FIGURES 2 and 3, a back-up plate member or supporting disc member 30 has been shown that is provided with a frustum conical portion 32. For convenience in manufacturing, the margin of the disc member 30 is provided with a marginal flange 34 which extends throughout the entire periphery. The center of the frustum conical portion is provided with an opening 36 in which is mounted a hub 38 used in mounting the blower on a shaft (not shown). The two sheet metal members 12 are carefully nested within the flange 34 of the supporting back-up plate member or disc 30. It is to be noted that the frustum conical portion 32 is provided with slots 42 into which the tips of the blades 10 are positioned. The flange 34 may be folded over the margins of the two disc members, as shown in FIGURE 2. The two sheet metal members 12 and the backing disc 30 may be metal laced (not shown). As one example, the metal lacing may be accomplished by striking tongue portions from one disc member into incisions formed in the adjacent members and turning over the ends of the tongue portions to lock same in position. This secures the three members together. One of the sheet metal members is backed by the backing disc 30. By metal stitching the spokes of the second sheet metal member, the bodies of these spokes are forced into contact with the backing disc 30.

The blower wheel is then placed in a forming jig or die assembly and the margins of the blades provided with the desired curvature. For example, the radius of curvature of the outer portion 52 may remain at 1.7"; but the lobe portion 54 may have a radius of curvature of 1.4", so as to form a scoop-like portion engaging the air stream.

A frustum conical ring member 60, shown in FIGURES 1, 2 and 6, is provided with a frustum conical portion 62, an axial flange 64 and a bevelled portion 66, the bevelled portion 66 surrounding the intake opening of the blower wheel. The conical ring member 60 is provided with a plurality of slots 70, one for each of the blades. A tab-like portion 72 of each blade projects through a slot 70 and is turned over, so as to fixedly lock ring member 60 to the blades, so that member 60, the back-up plate member 30 and the blades 10 cooperate to form radial channels for the flow of the air stream.

For some types of blower wheels, the outer marginal portion 20 of members 12 and the outer portion of the supporting disc 30 may be objectionable, in that these marginal rims have a tendency to retard the air flow. When this is found to be the case, the margins 20 of the

sheet metal members 12 and the outer margin of the supporting disc 30 may be severed, as indicated by the dash line 80a in FIGURE 1, after members 12 and 30 have been assembled and metal laced together.

The height of the frustum conical portion 32 is a matter of choice. For some types of blower wheels, it may be much lower and the slots 42 completely eliminated. This depends entirely upon the design of the blower wheel, the type of metal used, the speeds at which the blower wheel is to be driven, et cetera.

This blower wheel lends itself to be made from aluminum, thereby eliminating the necessity for painting or providing a finishing coating and the use of a protective coating to prevent corrosion, especially when used in the presence of moisture and damp air. It may also be made from sheet steel or stainless steel. The type of material depends upon the use to which the blower wheel is to be put.

Notches or registration devices may be used for properly positioning the blades of one sheet metal member 12 with respect to the blades of the other sheet metal member 12. Any suitable type of notches may be used, as for example, notches similar to those disclosed in my United States Letters Patent No. 2,982,468 for Blower Wheel and Method of Making Same.

In use, the blower is rotated at any desired speed for the particular use to which it is to be put. The air is drawn in through the opening in member 60 by the blades 10. Due to centrifugal force, the air is propelled through the channels formed between the blades and the backing disc 30, together with the conical portion 62 of member 60. Although the blades being radially disposed are farther apart near the outer periphery of the blower wheel than at the inner ends thereof, the outer opening is restricted or contracted by the conical portion 62, thereby increasing the pressure of the air.

The opening in member 60 is so designed as to have an air foil, producing a venturi effect upon the air flow. The size and the shape of the outwardly flared portion 66 may be designed to enhance the flow of air depending upon the amount of air that is moved by the blower. The axial depth of the outlet opening of the channels is less than the peripheral distance between the outer ends of adjacent blades.

In the modification disclosed, only two sheet metal members 12 have been shown. Instead of having a disc of sixteen blades, by using a third sheet of metal and nesting it upon the other two, a twenty-four bladed blower would then be produced, in which event the spacing of the blades in the final blower would be only approximately one-third of the spacing of the blades on each sheet metal member 12. Any number of sheet metal members may be nested together in order to obtain the desired number of blades.

Although the preferred embodiment of the device has been described, it will be understood that within the purview of this invention various changes may be made in the form, details, proportion and arrangement of parts, the combination thereof and mode of operation, which generally stated consist in a device capable of carrying out the objects set forth, as disclosed and defined in the appended claims.

The invention having thus been described, what is claimed is:

1. The method of manufacturing a turbine type blower including the steps of forming a pair of disc members, forming blades from the disc members, bending the blades from the plane of the disc members, said blades having tabs and being integral with the disc members, and a marginal portion on each disc member extending beyond the blades, forming an aperture in the center of each disc member, forming a supporting disc member, forming a frustum conical portion in the center of the supporting disc member, said frustum conical portion having equally spaced notches adjacent the apex, positioning the

pair of bladed disc members upon the supporting disc member with the frustum conical portion projecting through the aperture in said bladed disc member, and with the blades of one disc member being equally spaced between the blades of the other disc member, projecting the inner portions of the blades through the slots in the frustum conical portion, forming a frustum conical member with slots therein, forming a centrally disposed aperture in the frustum conical member, projecting the tabs of the blades through said last mentioned slots, turning the tabs against the side of the frustum conical member, forming an axially disposed flange surrounding the centrally disposed aperture in said frustum conical member, and flaring outwardly the outer margin of the flange to form a venturi intake opening for the turbine type blower.

2. The method of manufacturing a turbine type blower according to claim 1, wherein the method includes the step of lapping the outer margin of the supporting disc member so as to overlap the outer margins of the bladed disc members.

3. The method of manufacturing a turbine type blower according to claim 1, wherein the method includes the step of forming blades wherein the outer axial length of the blades approaches the spacing of the blades along the outer periphery of the blades.

4. The method of manufacturing a turbine type blower according to claim 1, wherein the method includes the step of forming blades, the radial length of each blade being much greater than the axial width of the blade.

5. The method of manufacturing a turbine type blower including the steps of forming a pair of sheet metal disc members with apertures in the center thereof, forming blades from the sheet metal members, bending the blades from the plane of the disc members, said blades having tabs and being integral with the sheet metal disc members, a circular marginal portion on each of said sheet metal members extending beyond the blades, forming a supporting disc member, forming a frustum conical portion in the center of the disc member, said frustum conical portion having equally spaced notches adjacent the apex, positioning the pair of bladed sheet metal disc members upon the supporting disc member with the notches of the frustum conical portion receiving the blades, there being one blade for each notch, the blades of one of the sheet metal members being equally spaced between the blades of the other sheet metal member, forming a frustum conical member with slots therein, forming a centrally disposed aperture in the frustum conical member, projecting the tabs of the blades through the slots, bending the tabs to secure the blades to the frustum conical member, forming an axially disposed flange surrounding the centrally disposed aperture in said frustum conical member, flaring outwardly the outer margin of the flange to form a venturi opening for the turbine type blower, and metal lacing for holding the disc members together.

6. The method of manufacturing a turbine type blower according to claim 5, wherein the radial length of each blower blade is greater than the axial width thereof.

7. The method of manufacturing a turbine type blower including the steps of forming a pair of sheet metal disc members having centrally located holes, forming blades from the sheet metal disc members, said blades having tabs and being integral with the sheet metal members, bending the blades from the plane of the disc members, a circular marginal portion on each of said sheet metal members extending beyond the blades, forming a supporting disc member, forming a frustum conical portion in the center of the disc member, said frustum conical portion having equally spaced notches adjacent the apex, positioning a pair of bladed sheet metal members upon the supporting disc member with the notches of the frustum conical portion receiving the blades, there being one blade for each notch, the blades of one of the sheet metal members being equally spaced between the blades

of the other sheet metal member, forming a frustum conical member having a plurality of slots, forming a centrally disposed aperture in the frustum conical member, projecting the tabs of the blades through the slots, bending the tabs to secure the blades to the frustum conical member, the aperture in the frustum conical member forming the intake opening of the blower wheel, lacing the disc members together and severing the outer margins of all of the disc members.

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