United States Patent

Holstrom

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[54] AIR FAN IMPELLER BLADE ASSEMBLY

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[52] **U.S. Cl.**.....**416/212**, 416/223, 416/240, 416/244

[51] **Int. Cl.**.....**F04d 29/34**

[58] **Field of Search**.....416/223, 237, 214, 212, 239, 416/204, 229, 240, 244

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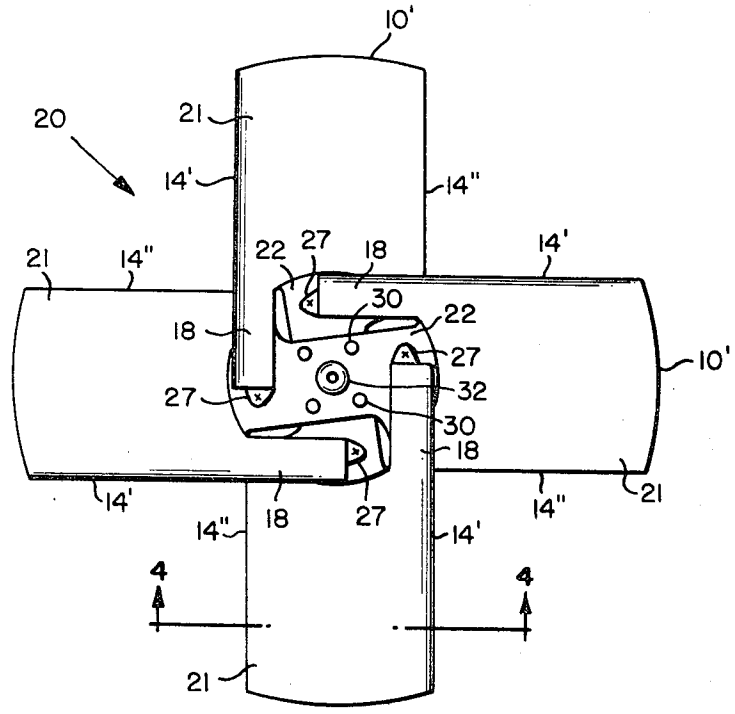
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[57] **ABSTRACT**

This impeller is constructed from two, identical, preformed metal blanks, which have raised center or hub sections which are secured to one another by riveting or the like. Opposite ends of each blade are laterally offset from one another slightly. Oppositely extending tabs are struck up from opposite sides of each blade at opposite sides of the hub section to provide slots by which the blades are interconnected to extend at right angles to one another. The tabs of one blade are secured to the hub section of the other blade to lend rigidity to the hub sections. A separate bearing may be secured in registering central openings in the hubs of the two blades to accommodate the armature shaft of a drive motor.

5 Claims, 4 Drawing Figures



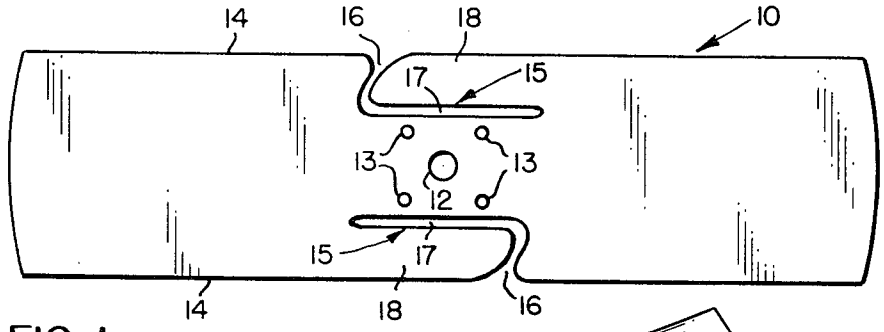


FIG. 1

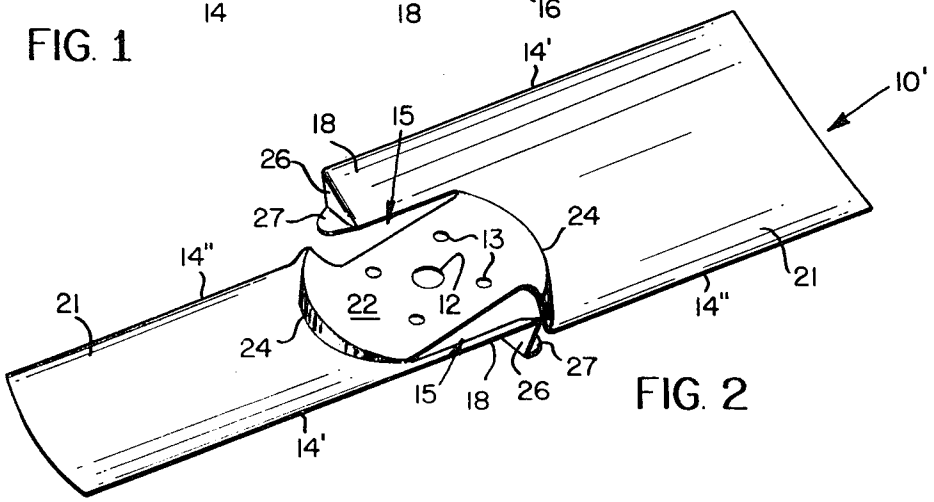


FIG. 2

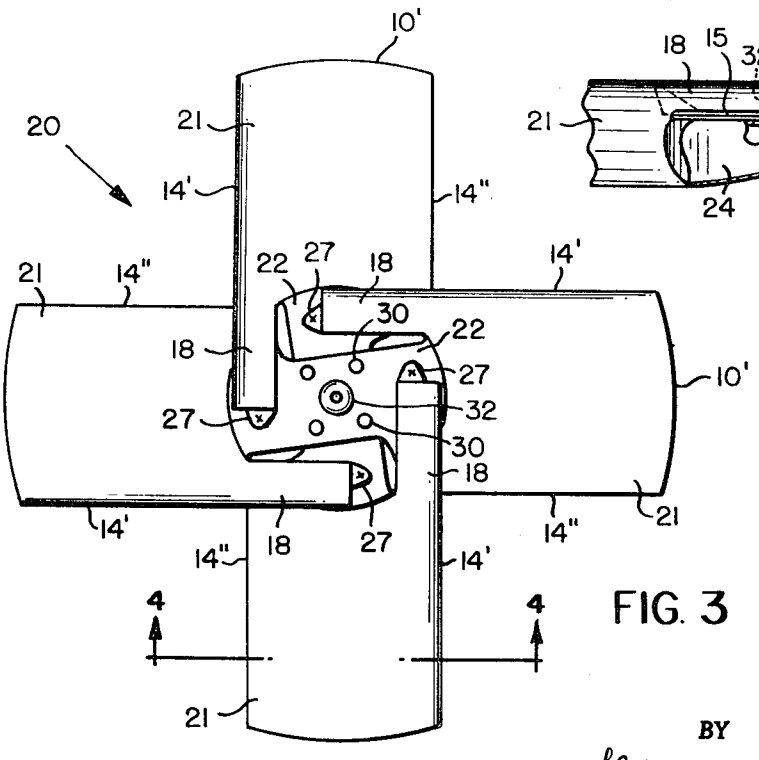


FIG. 3

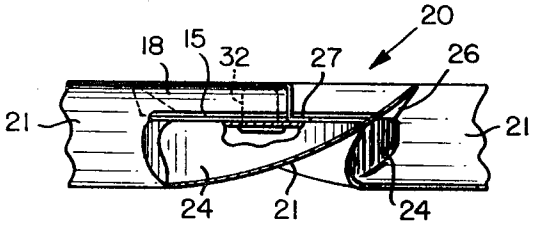


FIG. 4

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AIR FAN IMPELLER BLADE ASSEMBLY

This invention relates to air fans, and more particularly to a novel impeller blade assembly for such a fan.

Impellers of the type which are employed on relatively large air fans must have sturdy center mounts or hubs. For this reason such an impeller usually comprises a spoked center or spider, which is fabricated from a heavy gage metal. Separate metal petals or blades, the gage of which may or may not be the same as that of the spider, are then securely fastened to each spoke to complete the impeller assembly.

Although this typical construction produces an impeller having a satisfactorily sturdy hub or spider portion, nevertheless in the case of a four-bladed impeller, for example, it requires the steps of fabricating separate spiders and blades, and then the fastening of the blades to each spider at four places thereabout. Moreover, in those cases where the blades are made from a lighter gage metal than the associated spider or hub portion, it requires the use of two different gages of metal.

It is an object of this invention to provide an improved air fan impeller, which is substantially easier and less expensive to manufacture, than prior such impellers.

A further object of this invention is to provide an improved impeller of the type described, which is made entirely from metal of the same gage, and which nevertheless is equally as sturdy and reliable as prior such impellers.

A still further object of this invention is to provide a novel four-bladed air impeller, which can be fabricated entirely from but two, preformed blade blanks.

A still further object of this invention is to provide an improved four-bladed impeller of the type described in which opposed blades are made from a single, continuous blank, with the centers of each blank being secured to and reinforcing one another.

Other objects of the invention will be apparent hereinafter from the specification and from the recital of the appended claims, particularly when read in conjunction with the accompanying drawing.

In the drawing:

FIG. 1 is a front elevation of a flat sheet metal stamping blanked in accordance with one embodiment of this invention; to produce two air fan blades and their connecting hub;

FIG. 2 is a perspective view of this blank after it has been formed, and prior to its assembly in the impeller;

FIG. 3 is a front elevational view of an impeller made, in accordance with one embodiment of this invention, from a pair of formed blanks of the type shown in FIG. 2; and

FIG. 4 is a fragmentary sectional view taken along the line 4—4 in FIG. 3 looking in the direction of the arrows.

Referring now to the drawing by numerals of reference, and first to FIG. 1, 10 denotes an elongate, flat, sheet metal blank, which has been precut or stamped to form in its center a circular opening 12 surrounded by four, smaller circular openings 13, which are radially spaced from opening 12 at 90° intervals thereabout. Intermediate its ends the blank 10 is provided with two slots 15, which have curved entrant portions 16 opening on the opposite longitudinal side edges 14, respectively, and which have portions 17 internal of the blades, that are parallel to one another. These slots form oppositely directed, parallel tabs 18 at opposite sides of the blank.

After being stamped out, each blank 10 is subjected to a pressing operation, which produces the completed blank 10' (FIG. 2). This operation causes opposite ends 21 of the blank to be curved or dished in opposite directions and elevates the tabs 18 and the side portions 14' of the blank relative to the hub section 22 of the blank, as viewed in FIG. 2, and depresses the side portions 14'' so that the opposite ends or blade portions 21 of the blank are connected to the hub section by a pair of opposed, arcuate step or web portion 24. Moreover, as shown more clearly in FIG. 3, this pressing operation also causes opposite ends 21 of the blank to be offset or shifted slightly laterally to one another, so that opposite sides of the connecting hub section 22 are inclined slightly to the longitudinal side edges of the blank.

In addition to offsetting opposite ends 21 of the blank from one another, and from the associated hub section 22, the forming operation places a longitudinal curve or bow in each end 21 of the blank (see FIG. 4); and it also crimps or bends the terminal or free end of each tab 18 downwardly to form thereon a transverse web or skirt portion 26, and a lateral tongue portion 27, which is disposed substantially coplanar with the hub section 22 of the associated blank.

To assemble an impeller 20 the two blanks 10' are placed, one on top of, and almost parallel to, the other, and one blank is then twisted or swung about its midpoint relative to the other blank so that the two tabs 18 of one blank (for example the vertical blank 10' in FIG. 3) slide over the top of the hub section 22 of the other blank adjacent opposite ends thereof at the same time that the tabs 18 on the other blank (the horizontal blank 10' in FIG. 3) slide over the top of the hub section 22 of the second blank adjacent opposite ends of this latter hub section. The two blanks are then shifted until the holes 12 and 13 in their respective hub sections register, at which time the two blanks interconnect and are disposed at right angles to one another as illustrated in FIG. 3. The two blanks are then secured to one another by, for example, rivets 30, which pass through the registering openings 13, and by welding or otherwise securing the lateral tongue portions 27 to the underlying hub sections 22. A conventional bearing 32 may be secured in the registering openings 12 to accommodate the drive shaft of the motor that will be used to rotate the impeller.

From the foregoing it will be apparent that the novel impeller disclosed herein is substantially easier and less expensive to manufacture than prior such impellers. By assembling the impeller from two, identical, preformed blanks, the need for using a separate spider or hub portion, and then securing four separate blades to the spokes of the hub portion, is eliminated. In other words, exclusive of the securing means, the illustrated impeller 20 consists of only three parts, the two formed blanks 10' and the bearing 32, as compared, for example, to at least the five parts (spider and four separate blades) heretofore required. Moreover, unlike prior impellers wherein the blade sections had to be fastened by separate securing means to the hub section of the impeller, the blade ends 21 of each blank 10' are integral with the associated hub section 22 so that there is no likelihood of their being accidentally jarred loose from, or otherwise separated from the hub section during use. Furthermore, the transverse web portions 24, which are formed in the pressing operation, together with the integral tabs 18 of each blank, which overlap and are secured to the hub section 22 of the other blank at some distance from the center of the impeller, impart to the impeller a structural rigidity and strength every bit as good as that of prior impellers, which employ separate metal spiders or hub sections.

Having thus described my invention, what I claim is:

1. A rotary air fan impeller, comprising

a pair of elongate, identically-shaped members having central flat hub portions disposed in contiguity,

each of said members having a pair of blades integral with, and projecting from, opposite sides of its hub portion and inclined, respectively, in opposite directions relative to its hub portion,

the two blades of each member being laterally offset relative to one another, and extending transverse to the blades of the other member, and

each blade having a tab at its inner end integral therewith, the tabs of the two blades of each member extending in opposite directions along opposite sides, respectively, of the hub portion of that member in laterally spaced relation thereto, being offset relative to the plane of said hub portion, and projecting in opposite directions over the hub portion of the other member, and

means securing the tabs of one member to the hub portion of the other member and for securing the hub portions of the two members together.

2. An air fan impeller as defined in claim 1, wherein

each of said blades is bowed about an axis extending longitudinally thereof, and

the two blades of each member are twisted slightly in opposite directions relative to the associated hub portion.

3. An air fan impeller as defined in claim, 2, wherein the hub of each of said members has two diametrally opposite web portions extending transversely and connecting its hub portion with the adjacent ends of its blades.

4. An air fan impeller as defined in claim 1, wherein the hub portion of each of said members is inclined to the longitudinal side edges of its blades.

5. A rotary impeller comprising

two blade members disposed at an angle to one another,

each member having a flat, central hub portion and two blade portions projecting respectively from opposite sides of said hub portion and inclined in opposite directions, respectively, to the plane of said hub portion,

the hub portion of each blade member lying in a plane transverse to the axis of the impeller, and

each blade member having two generally right angular slots therein extending inwardly from opposite side edges, respectively, of the blade member and along opposite sides of the hub portion of the blade member, to form two tabs at opposite sides of the blade member that extend longitudinally of the blade member in opposite directions,

one blade portion of a blade member being offset laterally relative to the other blade portion of that blade member, and

the two blade members being disposed in internested relation with the hub portion of one blade member extending through the slots and under the tabs of the other blade member, and with the hub portions of the two members axially aligned one above the other, the two tabs of each blade member being fixed to the hub portion of the other blade member.

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