Jan. 22, 1929. 1,700,017

M. BENDER

IMPELLER FOR BLOWERS

Filed Dec. 20, 1927 2 Sheets-Sheet 1

Fig. 1.

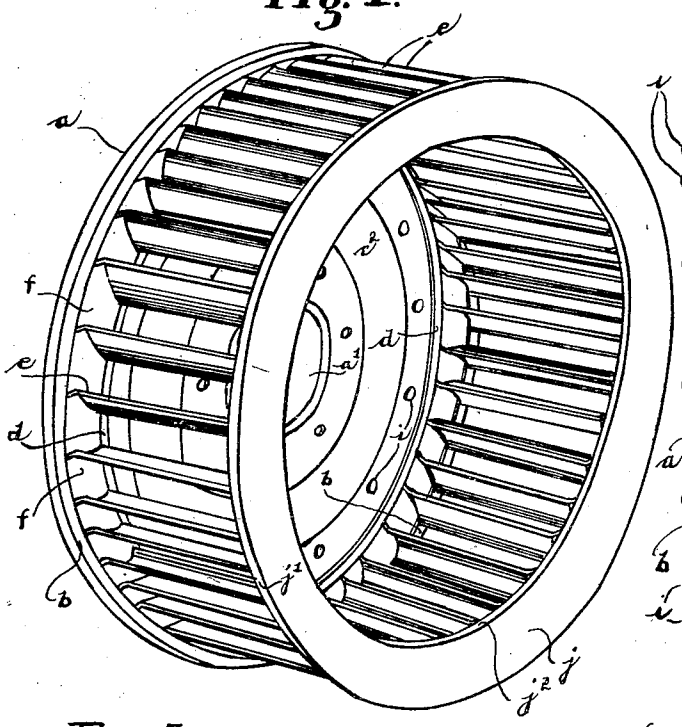


Fig. 2.

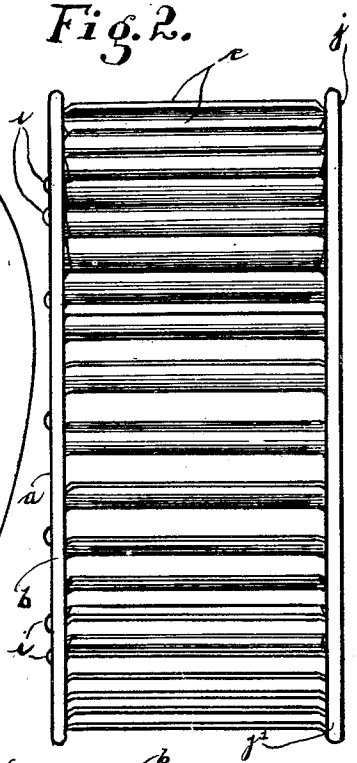
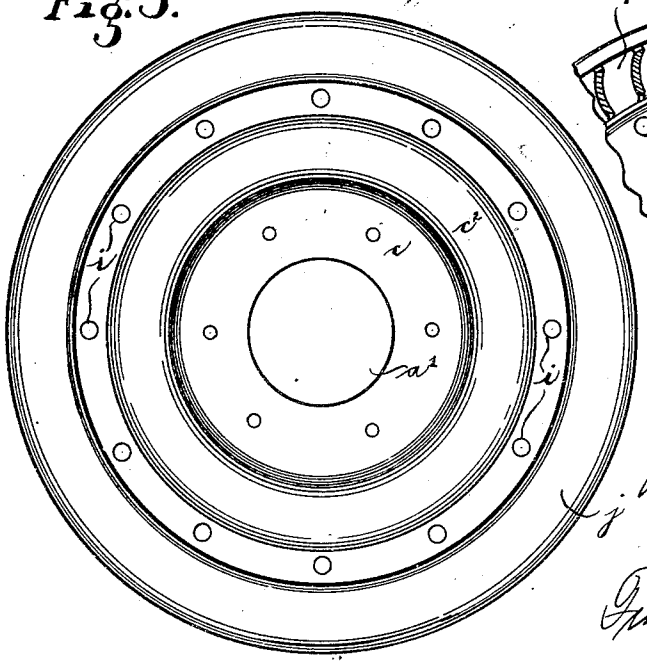


Fig. 3.



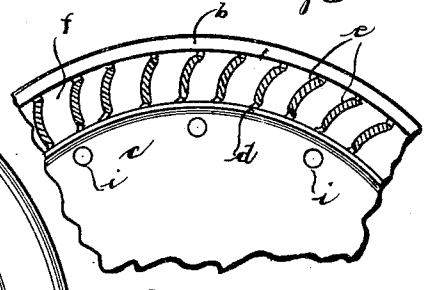


Fig. 4.

Martin Bender

INVENTOR

BY Frank P. Wentworth

ATTORNEY.

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M. BENDER

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Fig. 5.

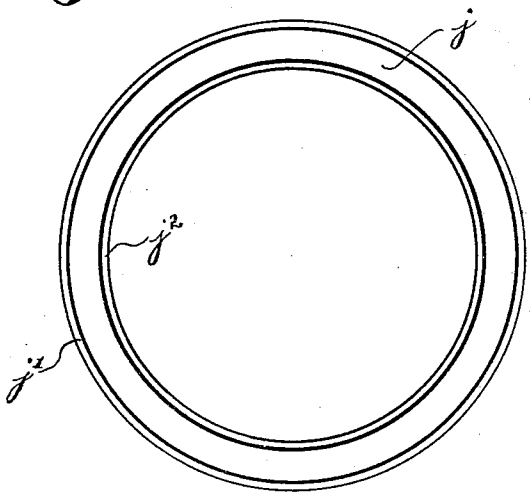


Fig. 8

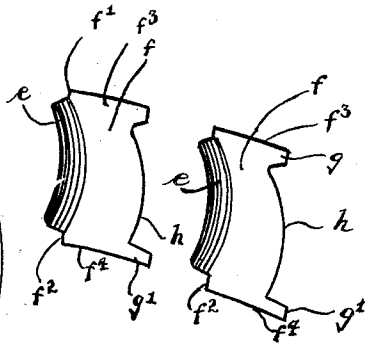


Fig. 9.

Fig. 6.

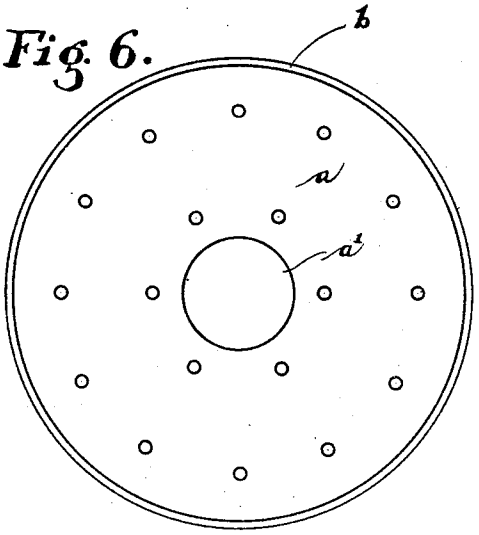
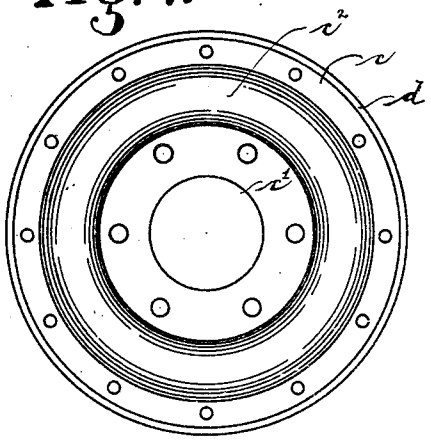


Fig. 7.



Martin Bender

INVENTOR

BY Isaacs & Isaacs

ATTORNEY

Patented Jan. 22, 1929. 1,700,017

UNITED STATES PATENT OFFICE.

MARTIN BENDER, OF GLEN RIDGE, NEW JERSEY, ASSIGNOR TO JACOBSON MANUFACTURING CO., OF NEWARK, NEW JERSEY, A CORPORATION OF NEW JERSEY.

IMPELLER FOR BLOWERS.

Application filed December 20, 1927. Serial No. 241,292.

My invention relates to impellers for blowers, and more particularly to a type of motor driven rotary impeller having axially extending vanes adjacent the perimeter thereof.

In certain types of oil burners used in domestic heating plants, it is the practice to use impellers of the general type to which my invention relates for introducing air into the combustion chamber of a furnace in a manner to secure a thorough admixture of air and finely subdivided fuel used. In some instances the air intake is about the perimeter of the impeller and the offtake is axially thereof, while in other instances the intake is axially of the impeller and the offtake is about the perimeter thereof. With devices of this kind there is no substantial compression of the air, and the vanes are not subjected to material wear by frictional contact with the walls of a casing as with ordinary compressors.

Heretofore, it has been the practice, in the production of such impellers to use either light castings or heavy sheet metal and to rivet the various vanes in position in relation to the opposite vane supporting plates of the impeller. With this manner of assembly, the mounting of the vanes is not only a matter of great difficulty, if the structure be such as to secure a desired rigidity, but there is a lack of balance throughout the structure, and excessive and unnecessary weight thereof, which combined, cause irregularity in the action of the impeller and material wear in the bearings of the motor used for driving the same.

With the above conditions in mind, I have produced an impeller which, by reason of the construction of, and the manner of combining, the various parts, will not only very much simplify the assembling of the structure, but will avoid the necessity for riveting each vane and will secure a substantially uniform, balanced condition throughout the structure. The construction is such that its weight is reduced to a minimum with a desired degree of rigidity.

The construction of the various vanes is such that the ends of adjacent vanes will interlock in relation to each other and afford means, co-operating with the wheel plates, which will admit of the securing of all of the vanes at each end thereof in position with the minimum of machine operations. The construction is also such that the parts may be so combined as to permit the impeller to be used either for delivering air about its perimeter or delivering air axially thereof, each of the vanes being an exact replica of every other, and the reversal of the mode of operation in the manner above referrd to, involving no changes in the construction of any of the parts, but merely an obvious reversal of the several vanes in relation to the parts supporting same.

All of the parts entering into the impeller structure may be formed by means of dies from sheet metal stock, which condition, combined with the manner of assembling the vanes, assists very materially in securing a proper balancing distribution of the weight throughout all parts of the structure.

The invention consists primarily in an impeller for blowers embodying therein such novel features of construction and combination of parts as are hereinafter set forth and described, and more particularly pointed out in the claims hereto appended.

Referring to the drawings,

Fig. 1 is a perspective view of an impeller embodying my invention;

Fig. 2 is a side view thereof;

Fig. 3 is a front view thereof;

Fig. 4 is a cross section of a fragmentary portion of the perimeter of the wheel;

Fig. 5 is a face view of the flanged ring;

Fig. 6 is a face view of the wheel disk;

Fig. 7 is a face view of the clamp disk;

Fig. 8 is an end view of two adjacent vanes before assembly; and

Fig. 9 is an enlarged sectional view of the end portion of one of said vanes.

Like letters refer to like parts throughout the several views.

In the embodiment of the invention shown in the drawings, I employ a sheet metal disk *a*, having a central opening *a'* therein, adjacent which the hub for securing the impeller to the motor shaft is secured. Extending about the perimeter of this disk is a narrow circular flange *b*.

Concentric with the disk *a* is a clamp plate *c*, having a central opening *c'* adapted to register with the opening *a'* of the disk *a*. The

edge of the plate c is slightly raised at d to an extent approximately equal to the thickness of the metal used in forming the vanes to be hereinafter referred to.

To facilitate the mounting of the clamp plate c upon the disk a, I provide a circular, formed up portion c^2 upon said plate which, in addition to compensating for surface irregularities in the disk and said plate, will impart rigidity to the entire end plate structure.

Carried by the disk a are a sequence of vanes e, the construction of each of which is identical with every other. Each of the vanes e is provided with opposite end wings f which extend beyond the opposite edges of the vanes in a manner to form bearing areas f'—f^2 adapted to be engaged by the flange b and the raised portion d of the clamp plate c. The outer edge of each end wing is outwardly curved as shown at f^3, Fig. 8, conforming in curvature with the ring flange of the plate a. The inner edge is similarly curved as shown at f^4 so as to conform with the curvature of the raised edge of the clamp plate c.

Adjacent the areas f'—f^2 projections g—g' are formed upon each wing, and the portion between these projections is curved as shown at h in conformity with the curvature of the vane, thus not only permitting a close fitting of the end wings of each vane with the end wings of the adjoining vane, but a lapping and close fitting of the wing of one vane with the adjacent vane, notwithstanding the necessary curvature of the sheet metal when forming the end wings integrally with the vane proper.

The projections g—g' extend beyond the opposite edges of the vane proper so that when adjacent vanes are brought together, the end wings will overlap the ends of the adjacent vane and also the opposite edges thereof, so that in the assembled structure all of the vanes will form a substantially continuous interlocked annular structure preventing any possible movement or displacement of any of the vanes.

The portions of the vanes f' and f^2 project beyond the vanes proper not only for the purpose of securing the lateral interlocking of the end wings, but for providing a bearing surface for clamping all of the vanes in position in relation to the disk a by the turning of the ring flange b thereof upon this extended portion of a wing of each vane, and by the forcing of the clamp plate c against the disk a when securing this plate in position upon said disk. The said clamp plate may be secured in its operative relation to the various vanes in any desired manner, as by means of rivets i passing through openings in said disk and said plate.

It will be noted that the dimensions of the end wings f will vary with the diameter of the disk a and with the required spacing of the vanes to secure a continuous ring construction when all of the vanes are assembled in the impeller.

To secure the desired rigidity in all of the vanes, the ends thereof, opposite to those secured to the disk a, are secured in the operative relation to each other and reinforced by means of a ring or annulus j having opposite flanges j'—j^2, the former of which is of the same diameter as the flange b on the disk a, and the latter of which is of the same inside diameter as the outside diameter of the clamp plate c.

Hence the channel of this ring j is adapted to receive the annulus formed by end wings f of the various vanes e so that the ring j may be secured in its operative relation to these vanes by the closing of the flanges j' and j^2 upon the laterally extended areas f'—f^2 of the various end wings f.

The ring j reinforces and supports the ends of the various vanes e in a manner to avoid any possible displacement of any of the vanes, or any possible movement of the end of any vane in relation to other vanes.

It is to be noted that the vanes e in their construction are identical and each vent is symmetrical in that the opposite ends are identical. Thus, they may be made from a single die or set of dies so as to ensure accuracy in the fitting of the various vanes embodied in an impeller without any tool work during the assembling operation.

If the vanes be set in the manner shown in the accompanying drawings, wherein the motor shaft carrying the impeller will have a clockwise rotation, the delivery of the air will be outwardly of the impeller. If it is desired to have the delivery of the air axially of the impeller the same parts as shown in the drawings will be used, it being merely necessary in assembling, to reverse and turn the various vanes so that the end wing f co-operating with the ring j, as shown in the drawings, will co-operate with the disk a. By reason of the curvature of the opposite edges of the wing f, no difficulty will be experienced in the assembling operation since it is merely necessary to locate the first impeller vane properly, after which all of the other vanes must be properly positioned in order to have the proper fit with the vanes already assembled.

For convenience of assembly, the various vanes are first assembled in relation to the ring j, and the edge flanges j'—j^2 closed upon the clamping areas f' and f^2 of the vanes. When the parts are in this position the opposite end wings f will be properly nested and interlocked so that there will be no difficulty in positioning all of the vanes simultaneously in relation to the disk a.

When so positioned, the clamp plate c is dropped into position and, when rivets are used, secured to the plate a thereby. The

plate *c*, when it enters the cage formed by the various vanes, will ensure the proper positioning of each vane with the curved edge f^3 in engagement with the flange *b* of the disk *a*. When the parts are thus positioned, the flange *b* may be turned upon the area *f'* thus firmly clamping each vane in position in relation to the disk *a*. By the use of proper tools and machinery the various vanes may be so tightened and secured in relation to the disk *a* and the ring *j* as to preclude any movement of any vane, or any slippage circumferentially of the impeller of the group of vanes. In fact these vanes are so tightly secured in position as to avoid any noises during the operation of the impeller arising from even the slightest looseness of the vanes.

It is to be noted that the structure in its entirety is made of sheet metal, and that the distribution of the weight is such as to secure substantially no overbalancing action at any point, that no rivets are required in securing the several vanes in position in relation to the disk *a* and the ring *j* beyond the few rivets for securing the clamp plate *c* in position when rivets are used, and that even when rivets are used they are so distributed as to not cause an overbalancing action.

While the various vanes *e* and the ring *j* are supported solely from the disk *a* and the plate *c*, the number and interlocking arrangement of the vanes *e* is such as to afford great rigidity in the structure, notwithstanding that these vanes are of fairly thin gauge sheet metal stock.

It will also be noted that there is no unnecessary weight about the periphery of the impeller which is particularly desirable as a fly wheel effect is not desired. All of the parts entering into the impeller, excepting the few rivets used when the plate *c* is secured to the disk *a* by means of rivets, may be stamped from sheet metal which is highly desirable, not only ensuring economy of manufacture, but a substantial identity in all impellers made from the same tools and dies.

It is not my intention to limit the invention to the precise details of construction shown in the drawings, it being apparent that such may be varied without departing from the spirit and scope of the invention.

Having described the invention, what I claim as new and desire to have protected by Letters Patent, is:—

1. A rotor for fans, including an annular row of vanes, each formed of sheet metal bent to curved form, terminal portions being disposed substantially at right angles to the body of the vane and wider than said body, said terminal portions serving to space the vanes apart, and an end wall having portions engaging the edges of said terminal portions to hold the parts together.

2. A rotor for fans, including an annular row of vanes, each formed of sheet metal bent to curved form, terminal portions being disposed substantially at right angles to the body of the vane and wider than said body, said terminal portions serving to space the vanes apart, and an end wall having a sheet metal portion with one edge beaded over to engage said terminal portions.

3. A rotor for fans, including an annular row of vanes, each formed of sheet metal bent to curved form, terminal portions being disposed substantially at right angles to the body of the vane and wider than said body, said terminal portions serving to space the vanes apart, and a shroud ring formed of sheet metal with its inner and outer edges beaded over to engage with and retain the opposite edges of said terminal portions.

4. A rotor for fans, including an annular row of vanes, each provided with a terminal portion at right angles to the length of the vanes, and an end wall formed of two plates secured together, said plates being of different diameters and having opposed edge portions for engaging there-between said terminal portions of the vanes.

5. A rotor for fans, including an annular row of sheet metal vanes, a sheet metal shroud ring, and a sheet metal end wall, said shroud ring and wall having portions bent into engagement with said vanes to serve as a means for holding said parts together.

6. An impeller for blowers embodying therein a disk having a flange about the perimeter thereof, a clamp plate secured to said disk with its perimeter spaced radially inwardly from said flange, a plurality of vanes having opposite end wings so formed as to seat between the flange of said disk and within the perimeter of said clamp plate, and a ring having edge flanges to receive the opposite end wings of said vanes, the flanges of said ring and said disk being turned so as to inclose edges of the end wings and said clamp plate being secured in relation to said disk with its edge portion in engageable relation with the end wings of said vanes, whereby said vanes are firmly held in relation to, and have their opposite ends supported by, said disk and said ring respectively.

7. An impeller for blowers embodying therein a disk having a flange about the perimeter thereof, a clamp plate secured to said disk with its perimeter spaced radially inwardly from said flange, a plurality of vanes having opposite end wings extending beyond the opposite edges of the vanes so formed as to seat between the flange of said disk and within the perimeter of said clamp plate and provide engaging edge areas upon said end wings, and a ring having edge flanges to receive the opposite end wings of said vanes, the flanges of said ring and said disk being turned so as to inclose edges of the end wings of said vanes and said clamp plate being secured in relation to said disk with its edge

portion in engageable relation with said end wings, whereby said vanes are firmly held in relation to, and have their opposite ends supported by, said disk and said ring respectively.

8. An impeller for blowers embodying therein a disk having a flange about the perimeter thereof, a clamp plate secured to said disk with its perimeter spaced radially inwardly from said flange, a plurality of vanes having opposite end wings extending beyond the opposite edges of the vanes so formed as to seat between the flange of said disk and within the perimeter of said clamp plate and provide engaging edge areas upon said end wings, and projections for interlocking with vanes adjacent said engaging areas respectively, and a ring having edge flanges to receive the opposite end wings of said vanes, the flanges of said ring and said disk being turned so as to inclose edges of the end wings of said vanes and said clamp plate being secured in relation to said disk with its edge portion in engageable relation with said end wings, whereby said vanes are firmly held in relation to, and have their opposite ends supported by, said disk and said ring respectively.

9. An impeller for blowers embodying therein a disk having a flange about the perimeter thereof, a clamp plate secured to said disk with its perimeter spaced radially inwardly from said flange, a plurality of vanes having opposite end wings extending beyond the opposite edges of the vanes so formed as to seat between the flange of said disk and within the perimeter of said clamp plate and provide engaging edge areas upon said end wings, and projections for interlocking with adjacent vanes adjacent said engaging areas respectively, portions of the wings intermediate said projections being curved to overlap and engage the end portions of adjacent vanes, and a ring having edge flanges to receive the opposite end wings of said vanes, the flanges of said ring and said disk being turned so as to inclose edges of the end wings of said vanes and said clamp plate being secured in relation to said disk with its edge portion in engageable relation with said end wings, whereby said vanes are firmly held in relation to, and have their opposite ends supported by, said disk and said ring respectively.

10. An impeller for blowers embodying therein a disk having a flange about the perimeter thereof, a clamp plate secured to said disk with its perimeter spaced radially inwardly from said flange, a plurality of vanes having opposite end wings extending beyond the opposite edges of the vanes and having the outer and inner edges thereof curved in conformity with the flange of said disk and the inner edge of said clamp plate, whereby each vane may be accurately fitted adjacent said flange and said clamp plate, engaging areas are formed adjacent said edges, and the position of each vane may be reversed to change the operative effect of the impeller without reversing the direction of its drive, and projections for interlocking with adjacent vanes adjacent said engaging areas respectively, portions of the wings intermediate said projections being curved to overlap and engage the end portions of adjacent vanes, and a ring having edge flanges to receive the opposite end wings of said vanes, the flanges of said ring and said disk being turned so as to inclose edges of the end wings of said vanes and said clamp plate being secured in relation to said disk with its edge portion in engageable relation with said end wings, whereby said vanes are firmly held in relation to, and have their opposite ends supported by, said disk and said ring respectively.

11. An impeller for blowers embodying therein a disk having a flange about the perimeter thereof, a clamp plate secured to said disk with its perimeter spaced radially inwardly from said flange, a plurality of vanes having opposite end wings extending beyond the opposite edges of the vanes so formed as to seat between the flange of said disk and within the perimeter of said clamp plate and provide engaging edge areas upon said end wings, and projections for interlocking with adjacent vanes adjacent said engaging areas respectively, portions of the wings intermediate said projections being curved to overlap and engage the end portions of adjacent vanes, the edge of said clamp plate being formed upwardly to an extent corresponding with the thickness of the material of said wings, and a ring having edge flanges to receive the opposite end wings of said vanes, the flanges of said ring and said disk being turned so as to inclose edges of the end wings of said vanes and said clamp plate being secured in relation to said disk with its edge portion in engageable relation with said end wings, whereby said vanes are firmly held in relation to, and have their opposite ends supported by, said disk and said ring respectively.

In witness whereof I have hereunto affixed my signature this 14th day of December, 1927.

MARTIN BENDER.