Jan. 5, 1954 H. WALTER 2,665,057

ROTARY BLOWER

Filed June 18, 1952 2 Sheets-Sheet 1

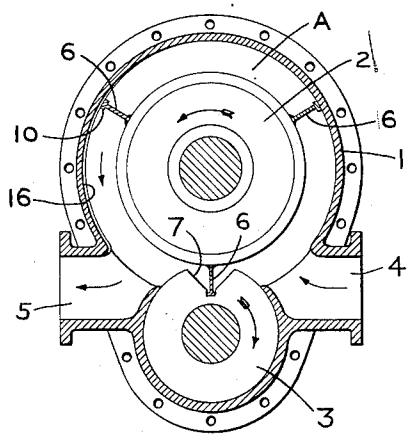


FIG. 1

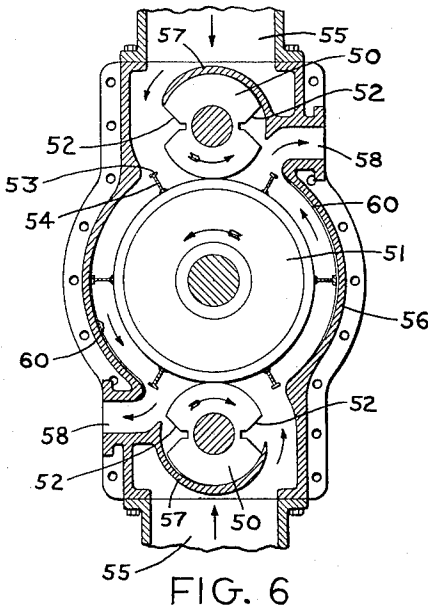


FIG. 6

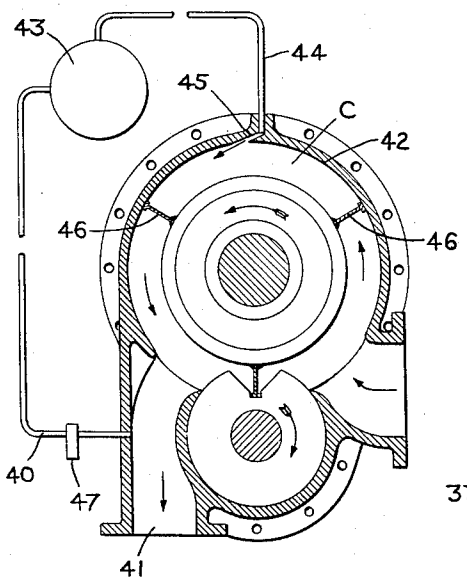


FIG. 5

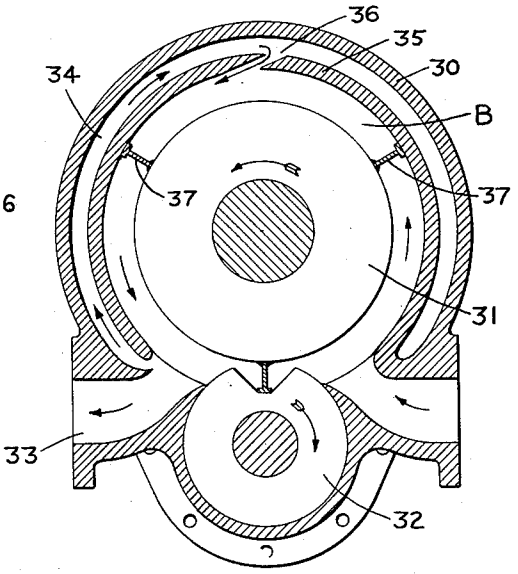


FIG. 4

HELLMUTH WALTER
INVENTOR.

BY Robert Meyer
attorney

Jan. 5, 1954 H. WALTER 2,665,057

ROTARY BLOWER

Filed June 18, 1952 2 Sheets-Sheet 2

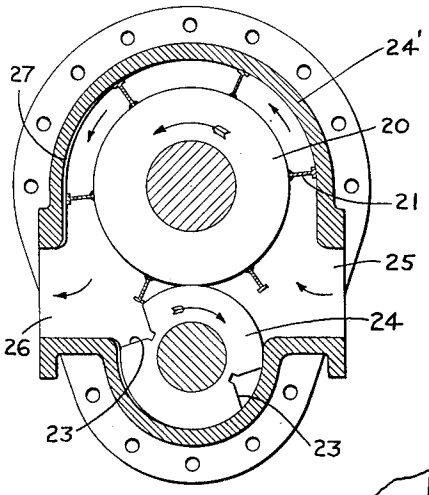


FIG. 3

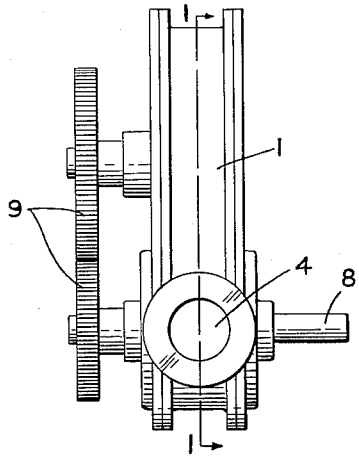


FIG. 2

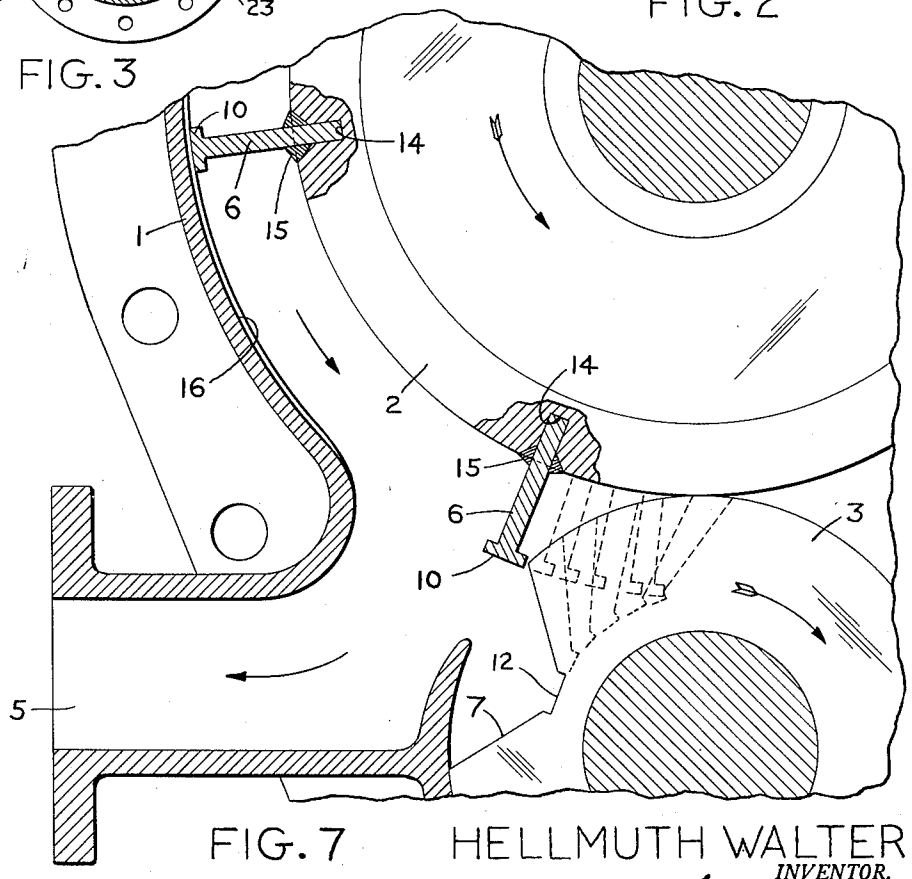


FIG. 7

HELLMUTH WALTER
INVENTOR.

BY Robert Meyer
Attorney

Patented Jan. 5, 1954

2,665,057

UNITED STATES PATENT OFFICE

2,665,057

ROTARY BLOWER

Hellmuth Walter, Upper Montclair, N. J.

Application June 18, 1952, Serial No. 294,171

5 Claims. (Cl. 230—150)

1

This invention relates to rotary blowers, gas exhausters and the like of the class in which two rotating members consisting of a rotary bladed impeller and a rotary valvular or abutment member cooperate to draw air or gas in through a suction opening in the enclosing casing or housing and expel it under an increased pressure through a discharge opening.

An objectional feature, in some uses and under some circumstances of use, of rotary blowers of this type now in use is that pulsations are set up in the discharge of the gas, and this is caused by air or gas at the discharge pressure blowing back into the space in the housing between the blade of the impeller approaching the outlet and the outlet or discharge opening.

An object of the present invention is to provide means which will eliminate pulsations in the discharge of gas or air from the blower by permitting the space between the impeller blade approaching the discharge opening or outlet and the next following impeller blade to gradually fill up to the pressure of discharge which prevents the back flow from the outlet and eliminates the pulsations in the discharge of the gas or air.

Another object of the present invention is to provide in a rotary blower of this type a relatively large impeller which is rotated at lower speed than the smaller valvular or abutment rotor, which permits employment of a smaller diameter abutment rotor and reduces the size and cost of the blower as well as reducing air friction or the so-called hydraulic losses.

Another object of the present invention is to provide a special novel construction of radial vane on the rotary impeller, together with a novel shape of vane receiving groove or recess in the abutment rotor which will result in constant intake and exhaust or discharge flow through the blower and will also provide a simplified construction of vane.

With these and other objects in view, as may appear from the accompanying specification, the invention consists of various features of construction and combination of parts, which will be first described in connection with the accompanying drawings, showing a rotary blower of a preferred form embodying the invention, and the features forming the invention will be specifically pointed out in the claims.

In the drawings:

Figure 1 is a vertical section through the improved rotary blower taken on the line 1—1 of Figure 2.

2

Figure 2 is an edge elevation of the improved rotary blower.

Figure 3 is a vertical cross section through a modified form of the improved rotary blower.

Figure 4 is a vertical cross section through another modified form of the rotary blower.

Figure 5 is a vertical cross section through a further modification of the rotary blower.

Figure 6 is a vertical cross section through a form of the rotary blower similar to that shown in Figure 1, differing therefrom in that an increased number of vanes are employed on the impeller with a proportionately increased number of recesses in the abutment rotor.

Figure 7 is an enlarged fragmentary view through a part of the rotary blower illustrating specifically the construction of the impeller vanes and of the impeller vane receiving recess in the abutment rotor.

Referring more particularly to the drawings the improved rotary blower includes a housing or casing 1 having an impeller 2 rotatably mounted therein and an abutment rotor 3 also rotatably mounted therein. The housing 1 has an inlet 4 opening thereinto and a discharge or outlet opening 5 through which the air or gas acted upon by the blower is expelled. As clearly shown in Figure 1 of the drawings the impeller 2 is of greater diameter than the abutment rotor 3 and the latter is rotated at a greater rate of speed than the impeller, the relative speeds of rotation of the two rotary elements in the blower being regulated to provide proper abutment engagement between the impeller vanes 6 and a part of the wall of the peripheral recess 7 formed in the abutment rotor, necessary to provide the compression of the air or gas acted upon by the impeller and discharged therefrom. The impeller 2 may be rotated from any suitable type of prime mover in any suitable manner through the medium of the shaft 8 and the rotor 3 is rotated from the shaft 8 through the medium of suitable gears 9 proportioned to provide the proper speed ratio between the rotor and the impeller.

The impeller 2 has a plurality of blades 6 circumferentially spaced about its perimeter and projecting radially therefrom. These vanes in the present invention are relatively thin, being substantially T-shaped in proportion with their heads 10 at their outmost extremities and normally movable in operative relationship with the inner wall of the portion of the housing 1 surrounding the impeller. The abutment rotor 3 which has its axis of rotation in the same vertical plane as the axis of the impeller 2 is pro-

vided with a peripheral recess 7, the walls of which converge at acute angles to the radii of the abutment rotor as they extend inwardly towards the axis of the abutment rotor. The innermost ends of the flat inclined sides of the recess 7 terminate at their inner ends in a flat surface 12. In certain figures of the drawings including 1 and 7, the flat surface 12 is shown as the inner wall or terminal of a shallow straight-sided recess shaped to receive and snugly fit the heads 10 of the impeller vanes 6 as is clearly shown in Figure 1 of the drawings thus providing an effective wall between the inlet 4 and the outlet 5 to prevent the escape of the gas or air acted upon by the blower back through the casing to the inlet 4.

As shown in Figure 7 of the drawings, during the rotation of the impeller 2 and the abutment rotor 3 the head 10 of the impeller vanes 6 just clears the flat inwardly inclining walls of the recess 7 as the vane 6 approaches its perpendicular position, at which time the head 10 is seated against the flat surface 12 to cut off the back flow of air or gas through the rotor. This cutting off action is effected slightly before the head 10 of the vane 6 engages the flat surface as indicated by the dotted line position of the vane at the farthest righthand dotted line position shown in Figure 7. As the impeller 2 continues its rotation after the position shown in Figure 1 of the drawings the vane 6 moves out of the recess 7 in a reverse manner to that shown in Figure 7 of the drawings.

The impeller vanes 6 are of extremely simple construction being made of flat material relatively thin and having the T-heads 10 formed on their outer ends with the inner ends of their leg portions seated in recesses 14 formed in the perimeter of the impeller 2, and it is preferable to weld the vanes 6 to the impeller 2 as indicated by the welds at 15.

During the operation of the device, the vane 6 which is in the cut-off position as shown in Fig. 1 moves with the rotation of the impeller 2 over the inlet 4 confining a quantity of air or gas between the two adjacent vanes 6. This quantity of air or gas is confined in this space between the two adjacent vanes until the rearmost vane forming the wall of the particular space passes a part of the outlet 5, at which time the air or gas is expelled through the outlet or discharge 5.

The pressure of the air or gas is slightly raised by the action of the blower so that the pressure at the discharge outlet is greater than the pressure of the air or gas at the inlet 4 and is greater at the outlet than the pressure in the confined spaces between adjacent vanes. In normal construction of rotary blowers this results in the backflow of the compressed air or gas as the outlet is open to the respective spaces causing a pulsation in the discharge of the air or gas from the blower. The present invention comprehends means to prevent the expulsion of the air or gas in pulsations and this is provided by means of an eccentric space indicated at 16 within the housing containing the impeller 2. The eccentric space 16 opens at its widest portion to the outlet opening 5 and extends therefrom in gradually decreasing cross-sectional area into the space indicated at A in Figure 1 of the drawings between two vanes approaching the outlet and providing a relatively enclosed space between the vanes. By permitting the backflow of air or gas through the eccentric space 16 the pressure of air or gas in the entire space A is gradually built up to that of the discharge outlet 5 so that as the space A moves into communication with the outlet 5 there will be no backflow of air or gas being discharged and consequently the pulsations in the discharge of the air or gas will be eliminated.

In Figure 1 of the drawings the impeller 2 is shown as having three blades or vanes and the abutment rotor 3 with having a single peripheral recess. This construction, however, may be modified to include any desired number of radially extending vanes on the impeller and any number of recesses in the abutment rotor 1 provide the proper protection of recesses and vanes in accordance with the speed of rotation of two rotary elements. Such a structure is shown in cross-section in Figure 3 of the drawings wherein the impeller 20 has a plurality of vanes 21 carried thereby and projecting radially from its periphery. The vanes 21 are of the same construction as the vanes 6 and move into and out of the peripheral recesses 23 formed in the abutment rotor 24. The recesses 23 are the same shape and configuration as the recesses 7 in the construction shown in Figure 1. The housing 24' is provided with an inlet 25 and an outlet 26 and it is also provided with the eccentric space 27 corresponding to the space 16 to provide pressure equalization in the confined space or chamber between two of the impeller vanes as it approaches the outlet 26. By increasing the number of vanes on the impeller and the number of recesses in the abutment rotor 24 the abutment rotor is balanced.

Figure 4 of the drawings shows a rotary blower of the same essential construction as that shown in Figure 1 including a housing or casing 30 in which is mounted the rotary impeller 31 and the abutment rotor 32. The impeller 31 and the abutment rotor 32 may be constructed either in the manner shown in Figure 1 or 3 of the drawings, or in the manner shown in Figure 6 of the drawings without departing from the spirit of the present invention. The modification shown in Figure 4 of the drawings deals only with the manner of delivering air from the discharge outlet 33 of the housing 30 to the space between two adjacent impellers which next approaches the outlet 33 during the operation of the blower. In this form shown in Figure 4 of the drawings the casing 30 is shown provided with a passageway 34 formed therein which has its inlet opening into the interior of the casing at the mouth of the outlet opening 33 and the inner wall 35 of the passageway 34 is provided with an opening 36 opening tangentially therethrough into the space B formed between two of the impeller vanes 37 just before they approach the outlet 33 so that air or gas under the discharge pressure may flow into the space B in a flow direction corresponding to the direction of rotation of the impeller 31 and thus increase the pressure in the space B to prevent pulsations in the gas or air as it is discharged. By making the opening 36 tangential to direct the air or gas into the chamber B in the direction of rotation of the impeller some of the re-expansion losses are reclaimed.

Figure 5 shows a modification of the rotary blower illustrating a further construction for delivering air or gas under pressure into the chamber between two adjacent impeller vanes as it next approaches the outlet of the rotary blower. In this construction a pipe 40 is shown opening into the discharge 41 of the casing 42 of the ro-

tary blower and this pipe discharges into a receiver 43. A second pipe 44 leads from the receiver 43 into the casing 42, discharging into a tangential opening 45 in the casing which opens into the space C between two of the impeller vanes 46 as this space C next approaches the outlet 41 for the purpose of delivering air or gas under substantially outlet pressure into the space C for preventing backflow from the outlet 41 into the space C as it gradually opens to the outlet and thus preventing pulsations in the discharge of the air or gas. A throttle as indicated at 47 may be interposed in the pipe 40 if it is so desired.

Figure 6 of the drawings shows a slight modification of the rotary blower in which abutment rotors 50 are placed one upon each side of the rotary impeller 51 and diametrically opposite each other. The abutment rotors 50 are each provided with a plurality of vane receiving recesses 52 which receive the heads 53 of the T-shaped impeller vanes 54. In the construction shown in Figure 6 the inlet openings 55 open into the casing 56 directly outwardly of the abutment rotors 50 and the incoming air or gas is directed into the spaces formed between the vanes 54 of the impeller by suitable direction partitions 57 formed in the casing 56 and surrounding part of the abutment rotors. The discharge outlets 58 are located at opposite sides of the housing 56 and in proper relation to the respective inlets 55 to provide the degree of compression of the air or gas desired during the operation of the rotary blower. The housing 56 is provided with eccentric spaces 60 similar to the eccentric spaces 16 in the housing 1 for the purpose of raising the pressure in the space between two adjacent vanes 54 as the space approaches the outlet so as to prevent pulsations in the discharge of the air or gas in the manner described in connection with Figure 1 of the drawings. By this design. the air flow is doubled.

In the double-acting rotary blower structure shown in Figure 6 of the drawings the rotor 51 is pressure balanced and the bearing load of this rotating rotor is subsequently caused only by the weight of the rotor 51.

It will be understood that the invention is not to be limited to the specific construction or arrangement of parts shown, but that they may be widely modified within the invention defined by the claims.

What is claimed is:

1. In a rotary blower, a casing having inlet and outlet openings therein, a rotary impeller rotatable in said casing, a plurality of radial vanes carried by said impeller and circumferentially spaced about the impeller to form gas-containing spaces within the housing which open to the inlet and outlet openings as the impeller rotates, an abutment rotor rotatably mounted in said casing and provided with at least one vane receiving recess to receive the impeller vanes successively to cut off communication between said inlet and outlet openings, said casing having an opening therein opening tangentially in the direction of rotation of the rotor into the interior of the casing at a point which is intermediate one of the impeller vanes as it approaches said outlet and the next successive impeller vane, whereby there is always at least one vane between said opening and the blower inlet and at least one vane between said opening and the blower outlet, said casing having a passageway formed therein having an inlet opening approximately at the casing outlet and communicating with said opening in the casing to permit gas under discharge pressure to flow back into the gas-containing space between said two impeller vanes.

2. In a rotary blower, a casing having inlet and outlet openings therein, a rotary impeller rotatable in said casing, a plurality of radial vanes carried by said impeller and circumferentially spaced about the impeller, an abutment rotor rotatably mounted in said casing and provided with at least one vane receiving recess to receive said impeller vanes successively, said radial impeller vanes being substantially T-shaped in cross section and comprising thin light body portions having their bases attached to the impeller with their heads at their outer ends, the ends of the head of said T-shaped vanes comprising flat straight end portions substantially parallel with the sides of the body portions of the vanes, said vane receiving recesses in said abutment rotor having straight tapering sides converging as they extend towards the axis of the abutment rotor and having flat straight surfaces at the inner ends of said recesses of an area substantially equal to the outer surface area of the heads of the T-shaped vanes, said straight tapering sides terminating in straight portions which extend substantially at right angles to the flat straight inner end surfaces and connect the tapering sides to the flat inner end surfaces, said straight right-angled portions being substantially equal in length to the thickness of the heads of the T-shaped vanes.

3. In a rotary blower, a casing having inlet and outlet openings therein, a rotary impeller rotatable in said casing, a plurality of radial vanes carried by said impeller and circumferentially spaced about the impeller, an abutment rotor rotatably mounted in said casing and provided with at least one vane receiving recess to receive said impeller vanes successively, said radial impeller vanes being substantially T-shaped in cross section and comprising thin light body portions having their bases attached to the impeller with their heads at their outer ends, the ends of the heads of said T-shaped vanes comprising flat straight end portions substantially parallel with the sides of the body portions of the vanes, said vane receiving recesses in said abutment rotor having straight tapering sides converging as they extend towards the axis of the abutment rotor and having flat straight surfaces at the inner ends of said recesses of an area substantially equal to the outer surface area of the heads of the T-shaped vanes, said straight tapering sides terminating in straight portions which extend substantially at right angles to the flat straight inner end surfaces and connect the tapering sides to the flat inner end surfaces, said straight right angled portions being substantially equal in length to the thickness of the heads of the T-shaped vanes, said abutment rotor being of smaller diameter than said impeller, means for rotating said impeller, means for rotating said abutment rotor at a greater speed of rotation than the speed of rotation of said impeller, the number of vanes carried by said impeller always being in excess of the number of recesses in said abutment rotor.

4. A rotary blower as claimed in claim 2 including means for rotating said rotary impeller and abutment rotor in predetermined relationship to each other whereby the ends of the heads of said T-shaped vanes will always make sharp line-to-line seal make and break contact with the point of junction of the straight and tapering portions

of the sides of the recesses in the abutment rotor.

5. In a rotary blower, a casing having inlet and outlet openings therein, a rotary impeller rotatable in said casing, a plurality of radial vanes carried by said impeller and circumferentially spaced about the impeller to form gas containing spaces within the housing which open to the inlet and outlet openings as the impeller rotates, an abutment rotor rotatably mounted in said casing and provided with at least one vane receiving recess to receive the impeller vanes successively to cut off communication between said inlet and outlet openings, said casing having an opening therein opening tangentially in the direction of rotation into the interior of the casing at a point which is intermediate one of the impeller vanes as it approaches said outlet and the next successive impeller vane whereby there is always at least one vane between said opening and the blower inlet and at least one vane between said opening and the blower outlet, and conduit means having inlet communication with the outlet opening of

the blower and communicating with said tangential opening in the casing to permit gas under discharge pressure to flow back into the gas containing space between said two impeller vanes.

HELLMUTH WALTER.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
313,415	Greindl	Mar. 3, 1885
589,462	Bibus	Sept. 7, 1897
622,949	Green	Apr. 11, 1899
912,549	Fagan	Feb. 16, 1909
1,000,615	McGary	Aug. 15, 1911
1,192,287	Easton	July 25, 1916

FOREIGN PATENTS

Number	Country	Date
497,234	France	Nov. 29, 1919
567,472	France	Dec. 7, 1923