Nov. 21, 1939. J. E. WHITFIELD 2,180,377

BLOWER

Filed April 24, 1936 3 Sheets-Sheet 1

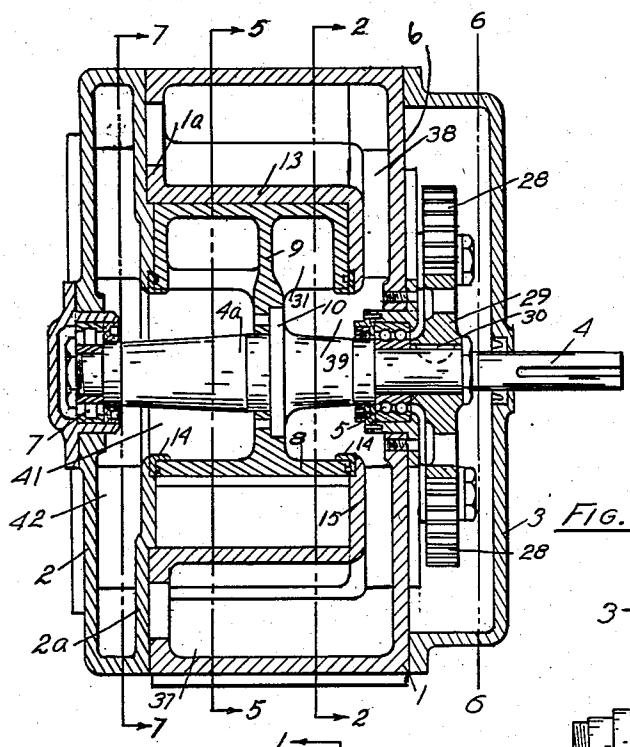


FIG. 1.

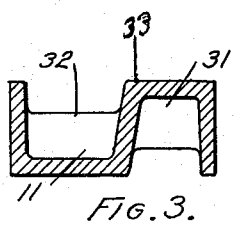


FIG. 3.

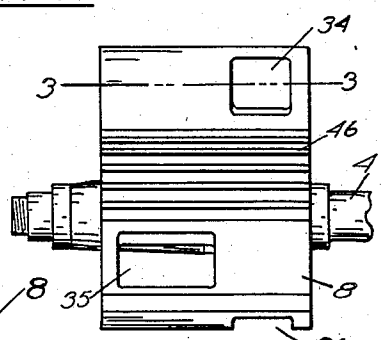


FIG. 4.

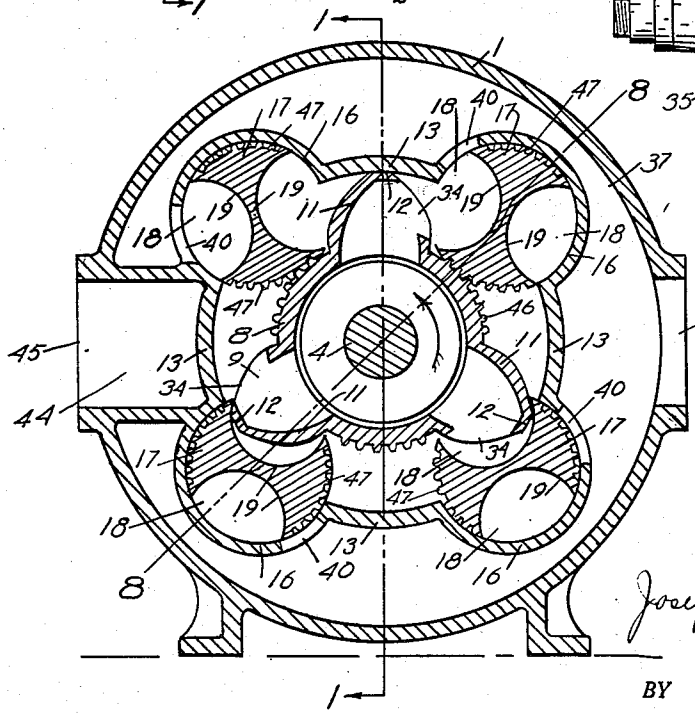


FIG. 2.

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BLOWER

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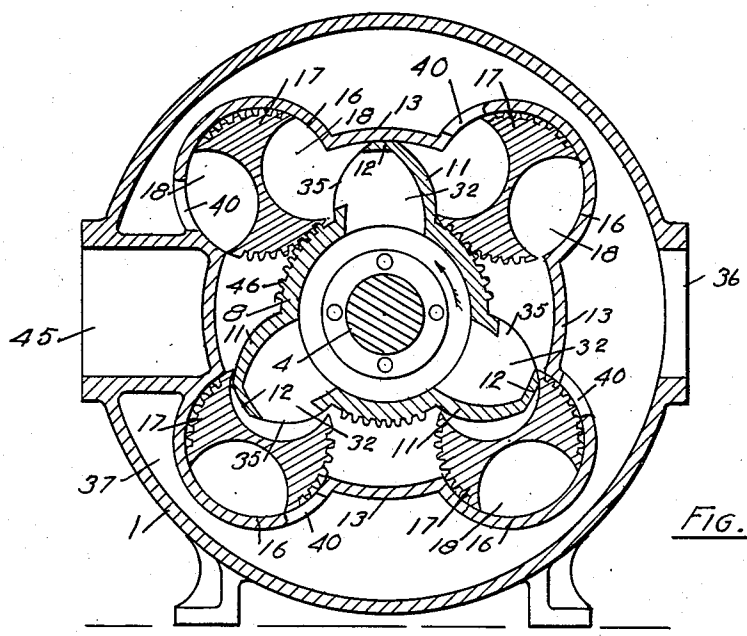


FIG. 5.

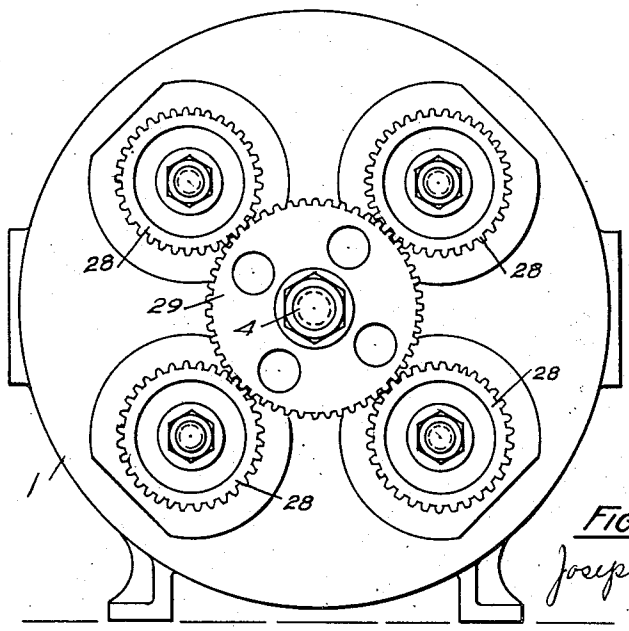


FIG. 6.

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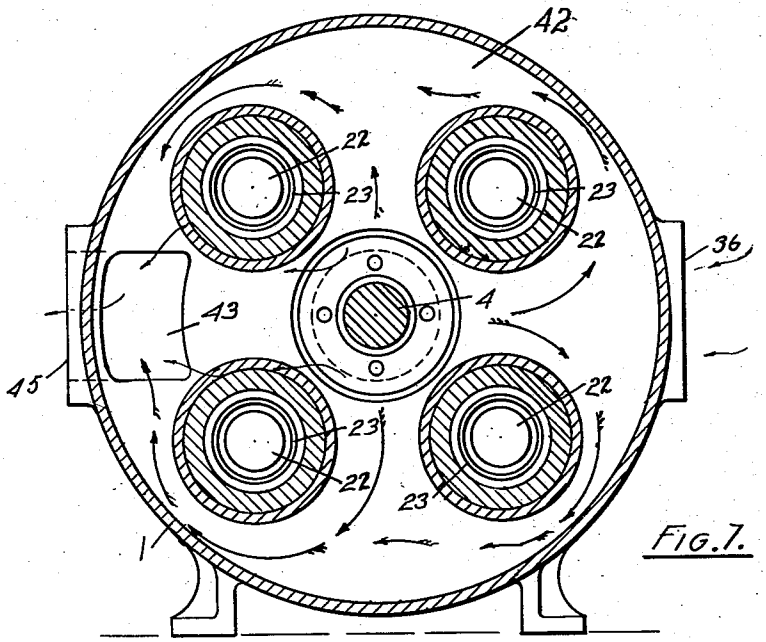


FIG. 7.

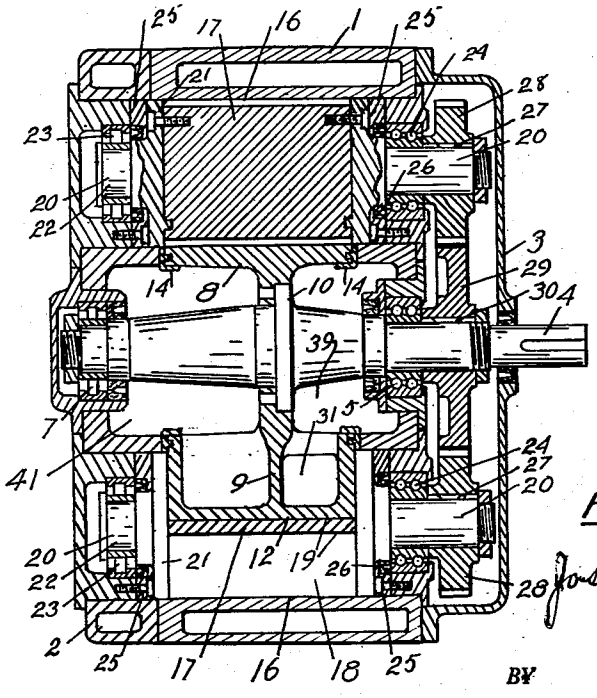


FIG. 8.

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Patented Nov. 21, 1939 2,180,377

UNITED STATES PATENT OFFICE

2,180,377

BLOWER

Joseph E. Whitfield, Grove City, Pa.

Application April 24, 1936, Serial No. 76,207

5 Claims. (Cl. 230—150)

This invention is directed to blowers of the type involving a positive displacement. In some respects the present invention is an improvement on the structure illustrated in my application Serial No. 29,525 filed July 2, 1935 and issued as Patent No. 2,130,054, September 13, 1938. In the structure of the former application the discharge from and intake to the blower was intermittent making very violent pulsations, reducing its efficiency and creating an undesirable noise. In the present invention the discharge from and intake to the blower is constant with a greater efficiency and quietness of operation. A further improvement of the prior application is the arrangement of ports through the rotor abutments. Preferably this involves both inlet and exhaust ports. It simplifies the structure, increases the port areas with relation to the compression chambers, and consequently increases the efficiency. Further features and details will appear from the specification and claims.

A preferred embodiment of the invention is illustrated in the accompanying drawings, as follows:

Fig. 1 shows a central section through the device on the line 1—1 in Fig. 2.

Fig. 2 a section on the line 2—2 in Fig. 1.

Fig. 3 a section of one of the abutments on the line 3—3 in Fig. 4.

Fig. 4 an elevation of the blower rotor detached.

Fig. 5 a section on the line 5—5 in Fig. 1.

Fig. 6 a section on the line 6—6 in Fig. 1.

Fig. 7 a section on the line 7—7 in Fig. 1.

Fig. 8 a section on the line 8—8 in Fig. 2.

1 marks the case. This is open at one side and provided with a cover 2, this cover having a rotor closing flange 2*a* which closes the case 1.

The opposite side of the case is provided with a cover 3. A drive shaft 4 is fixed with a rotor hub 4*a* and the shaft is carried by ball bearings 5 arranged in the end 6 of the case 1, and the roller bearing 7 mounted in the cover 2. The rotor 8 is carried by central web 9 which is secured to a flange 10 on the hub 4*a*. This web separates the interior of the rotor into two compartments. Abutments 11 extend from the peripheral wall of the rotor 8 and the outer faces 12 of these abutments form working closures with the interior peripheral surfaces of the wall 13 of the case 1, this wall being connected with the outer wall of the case by a web 1*a*. The rotor is sealed by rings 14 which are carried by a flange 15 extending inwardly from the shell 13 and by the return flange 2*a* of the cover.

Gate pockets 16 are formed in the shell 13 and gates 17 are arranged in these pockets. Each gate 17 is provided with two abutment grooves 18. The surfaces 19 are generated to maintain a closure with the abutment during the passage of the abutment through the gate.

Trunnions 20, Fig. 8, are provided for each gate. Plates 21 are secured to the ends of the gates and the trunnions 20 extend from these plates. The trunnion 22 at one end of each gate operates in a roller bearing 23 carried by cover plate 2. The trunnion at the opposite end of the gate is carried by a ball bearing 24 arranged in the end plate 6 of the case. Plates 25 are arranged at each of the sides of the plates 21 and sealing rings 26 are provided for the bearings. A gear 28 is fixed by key 27 on one of the trunnions of each gate, and the gears 28 mesh with a gear 29 which is fixed on the drive shaft by a key 30. The abutments 11 are hollow and close compartments 31 and 32 separated by a solid wall 33. The compartment 31 has an opening or port 34 through a rear wall of the abutment, and the compartment 32 a port 35 through the front wall of the abutment, the ports 34 serving as suction ports and the ports 35 as exhaust or discharge ports. The intake 36 leads into the side of the case 1 and into the chamber 37 between the outer wall of the case 1 and the shell 13. This chamber 37 communicates through the passages 38 between the flange 15 and end wall 6 of the case with a chamber 39 formed at one side of the web 9 in the rotor. The chamber 39 communicates with the compartment or chamber 31 in the abutment so that air is taken in through the machine distributed around the shell and delivered through the port 34 to the rear side of the abutment. This passage to the inside of the rotor through the one end of the abutment and out the ports 34 is continuously open. This intake may be termed the auxiliary intake. An intake of greater capacity is provided by means of a port 40 through the wall of the gate pocket in the shell. This port is open to the front groove 18 of the gate and delivers air by way of the port 40, groove 18 to the rear of the abutment as the abutment advances from the gate forming a suction area in front of the gate so that in this part of the movement of the abutment (see Fig. 2) air is delivered both through the port 34 and the port 40, thus giving a very large intake capacity to the suction space.

The discharge port 35 communicates by way of the chamber 32 with a chamber 41 within the rotor. The chamber 41 communicates with the

chamber 42 in the cover 2. A passage 43 extends through the wall 2a (see Fig. 7) and communicates with a passage 44 in the case. The passage 44 has a discharge opening 45 through the shell.

It will be noted that this discharge system involving front port 35 through to the opening 45 is continuously open for the discharge of air.

The outer periphery of the rotor is preferably cylindrical except for the abutment and is provided with a labyrinth seal formed with teeth 46 operating in conjunction with sealing teeth 47 on the gates. These make fairly close closures particularly on the peripheral faces of the teeth but are not intended to operate as driving units, this being accomplished by the gears 28 and 29.

In the structure here shown, the number of gates and the number of abutments vary, preferably the rotor being provided with a smaller number of abutments than there are gates. As shown, the number of abutments, three, operate in four gates. From this it will be seen that during the momentary closure of one of the ports 35 (see lower left-hand gate of Fig. 5) there is active discharge through the other two abutments and that the degree of compression from these two abutments and the position of these two abutments during their compression space varies, one abutment at the top of Fig. 5 having nearly closed its compression space while the abutment at the lower right hand side in Fig. 5 is advanced but a small portion of its travel in its compression space. Thus a discharge, practically continuous, is effected, and pulsations of air through the discharge passages thus practically eliminated and the efficiency lost due to such pulsations also largely eliminated. The even discharge also reduces very much the noise produced by the blower. Similarly the intake operates practically continuously. During the momentary closure of the intake ports on one abutment (see the lower right-hand abutment in Fig. 2), there is a free delivery of air to the other two intake spaces by way of the port 40 and groove 18 for the upper intake space and by way of the port 34 in the left-hand intake space, thence behind the lower left-hand abutment in Fig. 2. Thus without additional valves or additional valve closure spaces, almost continuous discharge and intake are provided for the compression and suction spaces at the front and rear of each abutment.

It will be noted that the closure groove 18 shall be shaped by generating a curve following the path of movement of the abutment so that there is a closure between the abutment and the walls of the groove throughout its movement, this closure being between convex and concave surfaces to more readily effect the closure and throughout a large part at least of the movement the closure being effected along more than one line of closure.

It will be noted that as the abutment enters the abutment groove 18 and continues its forward movement through the abutment groove the closure effected between the abutment and walls of the groove effectively separates the compression and intake portion of the compression space so that there is continued compression in front of the abutment and continued suction effect at the rear of the abutment. From this it follows that there is a continuous outflow from in front of the abutment and a continuous intake from the rear of the abutment.

I prefer to make all the closing surfaces operate in closing relation, but without actual contact. This is made possible by the ball bearings and gearing controlling the relation between the closing surfaces.

What I claim as new is:

1. In a blower, the combination of a case; a rotor mounted in the case, said rotor being spaced from the case forming an enclosed space; a fluid driving abutment on the rotor closing and sweeping said case; a rotating gate across the space, said gate by its rotation passing the abutment past the gate; an exhaust port in the abutment continuously open for discharge; an inlet port in the gate; and means driving the gate and rotor in timed relation.

2. In a blower, the combination of a case; a rotor mounted in the case, said rotor being spaced from the case forming an enclosed space; a fluid driving abutment on the rotor closing and sweeping said case; a rotating gate across the space, said gate by its rotation passing the abutment past the gate; an exhaust port in the abutment continuously open for discharge; inlet ports in the gate and abutment; and means driving the gate and rotor in timed relation.

3. In a blower, the combination of a case having a double wall forming an inlet passage, the inner wall of said case having a gate socket therein with a port leading from the inlet passage; a rotor mounted in the case, said rotor being spaced from the inner wall of the case and forming an enclosed space; a rotating gate across the space arranged in the socket, said gate controlling the inlet port through the wall of the socket, said abutment having an inlet port supplementing the port through the gate; and means driving the gate and rotor in timed relation.

4. In a blower, the combination of a case having a double wall forming an inlet passage, the inner wall of said case having a gate socket therein with a port leading from the inlet passage; a rotor mounted in the case, said rotor being spaced from the inner wall of the case and forming an enclosed space; a rotating gate across the space arranged in the socket, said gate controlling the inlet port through the wall of the socket, said abutment having a continuously open exhaust port; and means driving the gate and rotor in timed relation.

5. In a blower, the combination of a case having a double wall forming an inlet passage, the inner wall of said case having a gate socket therein with a port leading from the inlet passage; a rotor mounted in the case, said rotor being spaced from the inner wall of the case and forming an enclosed space; a rotating gate across the space arranged in the socket, said gate controlling the inlet port through the wall of the socket, said abutment having an exhaust port and inlet port supplementing the inlet port through the gate; and means driving the gate and rotor in timed relation.

JOSEPH E. WHITFIELD.