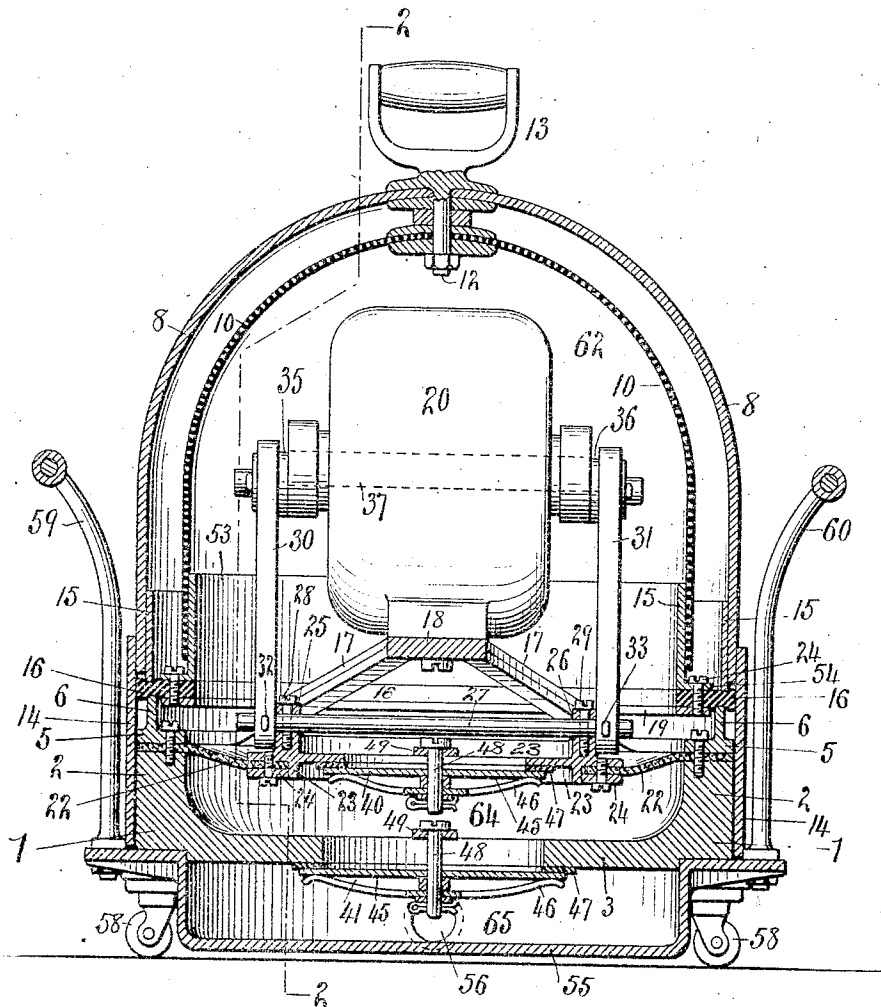


H. SMALL.
PORTABLE PNEUMATIC PUMPING APPARATUS.
APPLICATION FILED APR. 7, 1910.

1,183,129.

Patented May 16, 1916.
2 SHEETS—SHEET 1.

FIG. 1.



Witnesses:

W. H. Bleeland
David J. Mullan

Inventor:

Howard Small
By his Attorney

P. H. Little Goodwin

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2 SHEETS—SHEET 2.

FIG. 2.

FIG. 3.

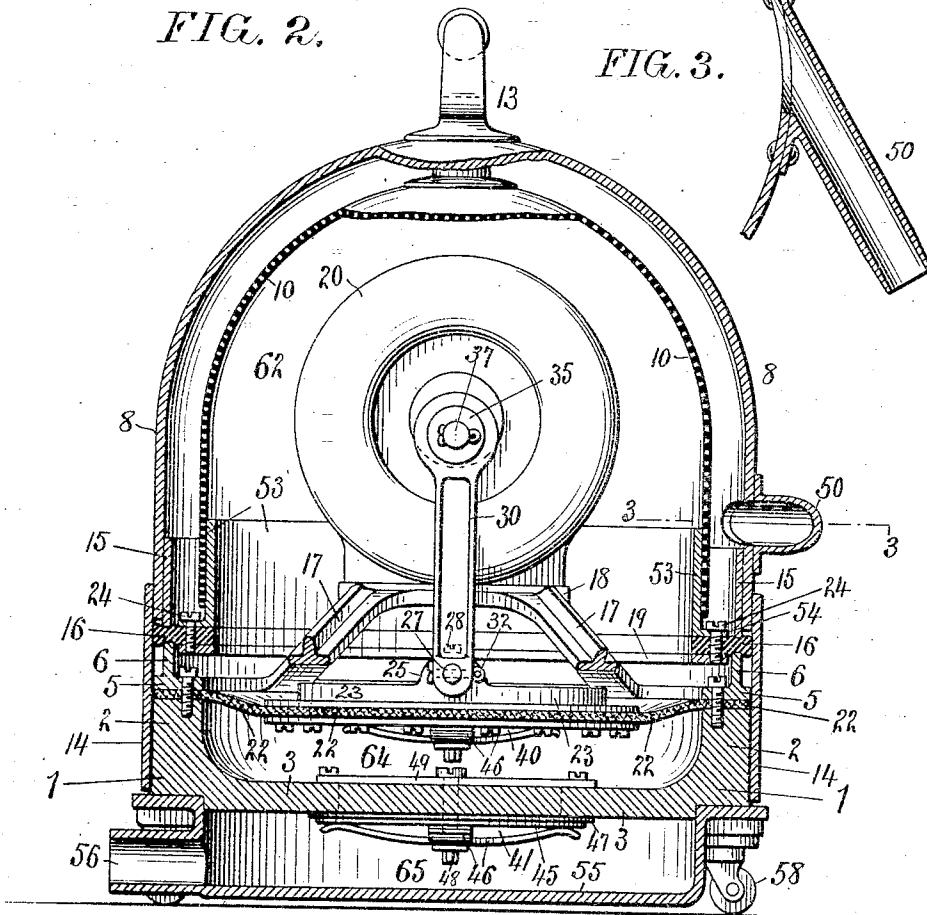
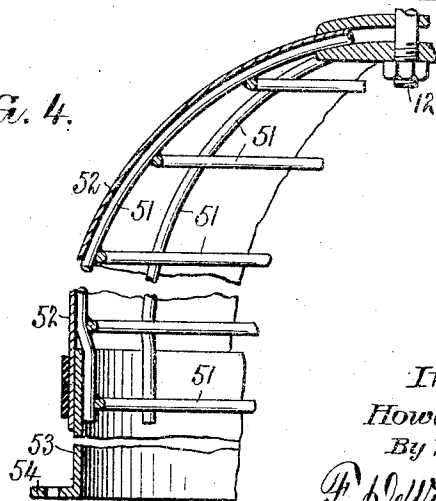


FIG. 4.



Witnesses

Wm. R. Cleeland

David J. Mullen

Inventor:

Howard Small

By his Attorney

F. Willitt Goodwin

UNITED STATES PATENT OFFICE.

HOWARD SMALL, OF ATLANTIC CITY, NEW JERSEY, ASSIGNOR TO JAMES H. BELL, OF PHILADELPHIA, PENNSYLVANIA.

PORTABLE PNEUMATIC PUMPING APPARATUS.

1,183,129.

Specification of Letters Patent.

Patented May 16, 1916.

Application filed April 7, 1910. Serial No. 553,935.

To all whom it may concern:

Be it known that I, HOWARD SMALL, a citizen of the United States, residing at Atlantic City, in the county of Atlantic, and State of New Jersey, have invented certain new and useful Improvements in Portable Pneumatic Pumping Apparatus, of which the following is a specification.

My invention relates to improvements in a portable pneumatic pumping apparatus for cleaning carpets, draperies and the like.

The object of my invention is to construct a pneumatic pumping apparatus in which the housing or casings form a vacuum chamber and a pulsation chamber and having a vibrating member separating said chambers, with means for operating said vibrating member together with suitable valve mechanism. The said pulsation chamber being made relatively large to form a clearance space in addition to the space actually required for the movements of the pumping member.

A further object of my invention is to arrange the said chambers and the operating means in alinement with said vibrating member.

A still further object of my invention is to provide double connecting rods between the vibrating member and the operating means; and a still further object of my invention is to connect the said vibrating member with the connecting rods so as to limit the oscillating movement of said vibrating member.

These together with various other novel features of construction and arrangements of the parts constitute my invention.

Referring to the accompanying drawings, in which like references refer to like parts: Figure 1 is a vertical central section of my improved pneumatic pumping apparatus; Fig. 2 is a vertical section on line 2—2 Fig. 1; Fig. 3 is a horizontal section on line 3—3 Fig. 2; and, Fig. 4 is a partial vertical section of the screen, drawn on a larger scale.

In the drawings 1 represents the base which is circular in form, having a side wall 2 and a bottom portion 3. Upon the top surface of the side wall 2 of the base is a ring 5, having an upwardly turned flange 6, which supports the hood 8 and the screen 10, which are secured together at the top by the bolt 12, having a handle 13 by which

the hood and the screen may be lifted off the base 1.

The hood 8 has a bottom section 14 which is adapted to encircle the base 1 and said hood also has a flange 15 secured to the inner surface of the same, which flange rests upon the rubber ring 16, which in turn rests upon the upwardly turned flange 6, of the ring 5, secured to the base 1. Thus making an air tight joint between the hood 8 and the base. The said rubber ring 16 is secured to and carried by the lower edge of the screen 10. The said ring 5, secured to the base 1, has formed thereon arms 17, which extend upwardly and toward the center of the ring and terminate in the base-plate 18, on which is secured the electric motor 20, positioned in vertical alinement with the base 1 and the hood 8, above described. Between the said ring 5 and the side wall 2 of the base is clamped a flexible diaphragm 22, preferably made of leather. Said diaphragm 22 has a circular opening formed in the center thereof and the inner edge of said diaphragm is secured to the circular metal collar 23, which latter and the diaphragm are referred to as a vibrating member. A clamping ring 24 secured to said collar 23, by screws or other suitable means, securely holds the inner edge of said diaphragm to said collar.

The collar 23 has oppositely positioned supports 25 and 26 in which is mounted a shaft 27, rigidly secured in said supports by set-screws 28 and 29.

Connecting rods 30 and 31, are connected to the ends of the shaft 27, by pins 32 and 33, and the opposite ends of said connecting rods embrace the eccentrics 35 and 36 secured upon each end of the shaft or armature 37 of the motor 20. When the shaft 37 of the motor is rotated, the collar 23 will vibrate rapidly. The two connecting rods will hold one axis of the collar parallel with the motor shaft 37 and the oscillating movement of the opposite axis of the collar will be limited by the connection between the collar 23 and the connecting rods 30 and 31, which prevents the flexible diaphragm 22 from receiving an unusual strain or from being worn in certain portions, due to the tilting of the collar 23.

The collar 23 and the bottom 3 of the base 1 are provided, in the center thereof, with valves 40 and 41 respectively. Said

valves are similar in construction: Each valve 40 and 41 comprises a flexible metal disk 45, a spring 46, tending to normally hold the edges of said disk against the packing ring 47. The spring 46 is carried by a pin 48, which passes through an aperture in the center of the valve disk 45. The said pin 48 is held by a rigidly secured cross-bar 49.

The hood 8 is provided with an inlet pipe 50, shown in Figs. 2 and 3. The said inlet pipe is connected tangentially with the hood so that the intruding air carrying dust and dirt will not strike directly upon the screen but will be distributed around the space formed between the hood and the outer surface of the screen, in which space the dust and dirt is collected and the air is drawn through the screen into the vacuum chamber. The inlet pipe 50 is adapted to have a flexible tube attached thereto through which air may be drawn.

The screen 10, shown diagrammatically in Figs. 1 and 2 and in detail on a larger scale in Fig. 4, is made of an open wire structure or cage 51, covered with fabric 52, which will permit the air to pass through the same and collect the dust, which is drawn through the inlet pipe 50, into the space formed between the hood 8 and the outside surface of the screen 10. The hood and the screen may be readily lifted off the base and the hood separated from the screen, by means of the bolt 12, for the purpose of cleaning the screen. The interior of the screen is open at the bottom so that it may be placed over the motor. The lower edge of the screen is provided with a metal lining 53 to strengthen the same. Said metal lining has an outwardly projecting flange 54 to which the rubber ring 16 is securely held by the clamping ring 19 and the screws 24, or any other suitable means. The base 1 has secured to its under side a casing 55 which forms a compression chamber 65. Said casing 55 is provided with the outlet pipe 56. The base is provided with casters 58 and also with the handles 59 and 60.

The method of operation of my invention is as follows: The motor is operated by a source of electric current, the vibrating member or collar 23 having the two connecting rods attached thereto, is reciprocated rapidly by said motor, causing the valve 40 upon said collar to operate and draw the air from the vacuum chamber 62, into which it is admitted, through the inlet pipe 50 formed in the hood, and force the air into the pulsation chamber 64. The valve 40 closes when the collar 23 moves toward the pulsation chamber 64 and opens when the collar moves in the reverse direction. The pulsation chamber 64 is provided with a valve 41 which is so arranged that it allows the air to pass out of the pul-

sation chamber and prevents the air from entering said chamber at this point. The air is forced from the pulsation chamber through the valve 41 into the compression chamber 65, from which it may be forced through the exhaust pipe 56 and utilized for blowing purposes or any purpose which requires air under pressure. The air may be allowed to freely escape through the exhaust pipe 56 when it is not desired to have it perform any other function.

It will be noted that in the present method of operation, my invention will pump air from a lower to a higher pressure, or in other words from vacuum, or a pressure below atmospheric pressure, to a pressure above atmospheric pressure. The flexible connection or diaphragm 22 between the vibrating collar and the base permits the motor to operate the collar very rapidly, avoiding friction and wear of the movable parts. By mounting the motor in alignment with the vibrating collar and diaphragm, two connecting rods may be used, which connecting rods are arranged at each end of the motor so that the strain upon the armature of the motor will be equalized and allow the motor to run freely, at a very high speed and the power exerted through the connecting rods is evenly distributed upon the said vibrating member. By connecting the collar 23 with the connecting rods as herein described the lateral or tilting movement of the collar is limited. The pulsating chamber 64 is made relatively large and of greater capacity than the amount of the displacement of the vibrating collar and the diaphragm, for the purpose of forming a clearance chamber, which will permit the air in said chamber 64 to expand and contract sufficiently to prevent the stalling of the motor when the air inlet or exhaust pipes may be temporarily closed.

My new and novel construction involves the method of pumping from vacuum to pressure; it also involves a method of pumping and maintaining a variable vacuum and limiting the amount of vacuum by the amount of space in the pulsation chamber; it also involves a method of unloading the motive power at a predetermined load by the amount of space in the pulsation chamber; it also involves a method of pumping from vacuum to pressure by creating higher and lower pressures in a given space and limiting the lower pressure by the amount of space and utilizing the higher pressure to aid in returning the pumping member.

Having thus described my invention I claim and desire to secure by Letters Patent:

1. In a pneumatic pumping apparatus, the combination of an inclosure forming a vacuum chamber with a restricted inlet, a pulsation chamber having said vacuum

chamber connected thereto, a vibrating member suitably supported at its outer edges, a motor mounted upon a suitable support, a shaft in said motor, connecting rods 5 operatively mounted upon each end of said shaft, means for connecting each of said connecting rods to said vibrating member at opposite points to hold one axis of said vibrating member parallel with said shaft 10 and means for limiting the oscillation of the opposite axis of said vibrating member from a horizontal position, valve mechanism controlled by said pulsation chamber and said motor, vibrating member, pulsation chamber 15 and valve mechanism being in vertical alinement.

2. In a pneumatic pumping apparatus, the combination of an inclosure forming a vacuum chamber with a restricted inlet, a pulsation chamber having said vacuum 20 chamber connected thereto, a vibrating member suitably supported at its outer edges, a motor mounted upon a suitable support within said vacuum chamber, a shaft in said motor, connecting rods operatively 25 mounted upon each end of said shaft, means for connecting each of said connecting rods to said vibrating member at opposite points to hold one axis of said vibrating member parallel with said shaft and means for limiting the oscillation of the opposite axis of 30 said vibrating member from a horizontal position, valve mechanism controlled by said pulsation chamber and said motor, vibrating member, pulsation chamber and valve mechanism being in vertical alinement. 35

3. In a pneumatic pumping apparatus, the combination of an inclosure forming a vacuum chamber with a restricted inlet, a 40 pulsation chamber having said vacuum chamber connected thereto, a compression chamber, a vibrating member suitably supported at its outer edges, a motor mounted upon a suitable support, a shaft in said 45 motor, connecting rods operatively mounted upon each end of said shaft, means for connecting each of said connecting rods to said vibrating member at opposite points to hold one axis of said vibrating member parallel with said shaft and means for limiting the oscillation of the opposite axis of said vibrating member from a horizontal position, valve mechanism controlled by said pulsation chamber and said motor, vibrating member, pulsation chamber and valve mechanism being in vertical alinement. 50

4. In a pneumatic pumping apparatus, the combination of an inclosure forming a vacuum chamber with a restricted inlet, a pulsation chamber having said vacuum 60 chamber connected thereto, a compression chamber, a vibrating member suitably supported at its outer edges, a motor mounted upon a suitable support within said vacuum chamber, a shaft in said motor, connecting 65 rods operatively mounted upon each end of said shaft, means for connecting each of said connecting rods to said vibrating member at opposite points to hold one axis of said vibrating member parallel with said shaft and means for limiting the oscillation of the opposite axis of said vibrating member from a horizontal position, valve mechanism controlled by said pulsation chamber and said motor, vibrating member, pulsation chamber and valve mechanism being in vertical alinement. 70

5. In a pneumatic pumping apparatus, the combination of an inclosure forming a vacuum chamber with a restricted inlet, a pulsation chamber having said vacuum 75 chamber connected thereto, a compression chamber, a vibrating member suitably supported at its outer edges, a motor mounted upon a suitable support within said vacuum chamber, a shaft in said motor, connecting rods operatively mounted upon each end of said shaft, means for connecting each of said connecting rods to said vibrating member at opposite points to hold one axis of said vibrating member parallel with said shaft and means for limiting the oscillation of the opposite axis of said vibrating member from a horizontal position, valve mechanism controlled by said pulsation chamber and said motor, vibrating member, pulsation chamber and valve mechanism being in vertical alinement. 80

In testimony whereof I affix my signature in presence of two witnesses.

HOWARD SMALL.

Witnesses:

ARTHUR C. PENTON,
M. R. CLEELAND.