

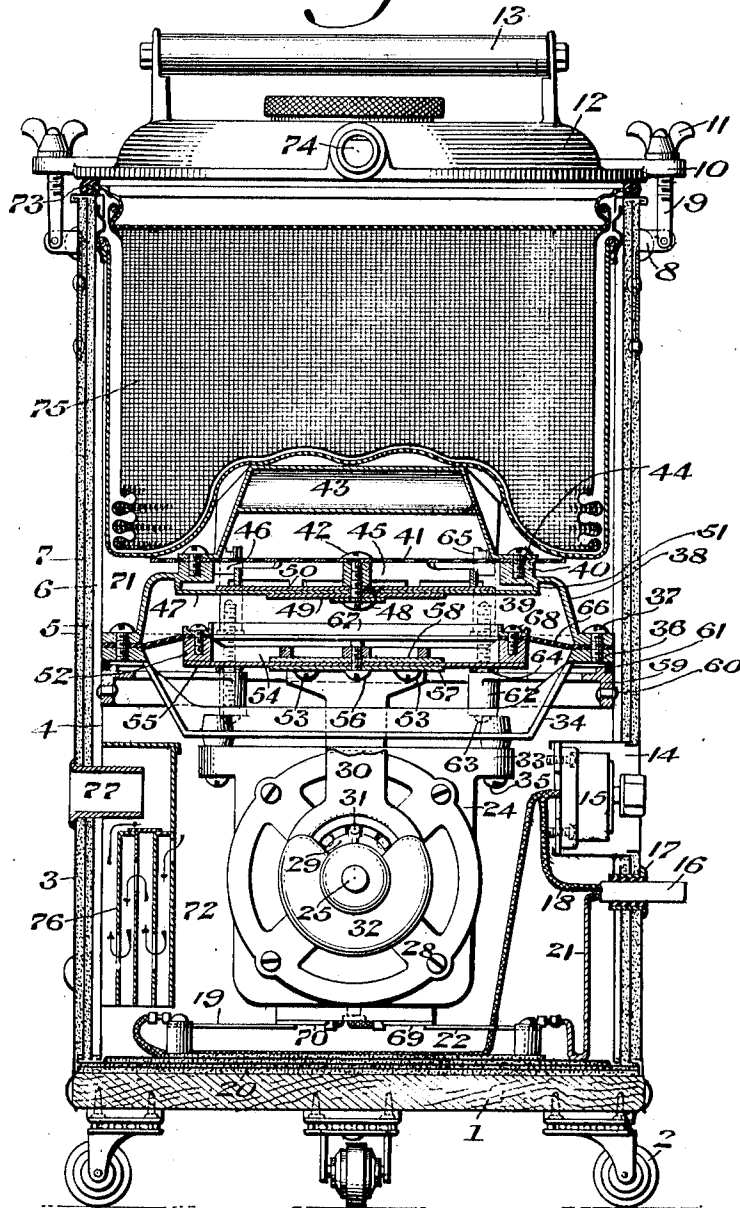
J. W. SMITH.
PNEUMATIC PUMPING APPARATUS FOR VACUUM CLEANERS.
APPLICATION FILED MAY 15, 1909.

1,031,151.

Patented July 2, 1912.

2 SHEETS-SHEET 1.

Fig. 1.



WITNESSES

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Fig. 2.

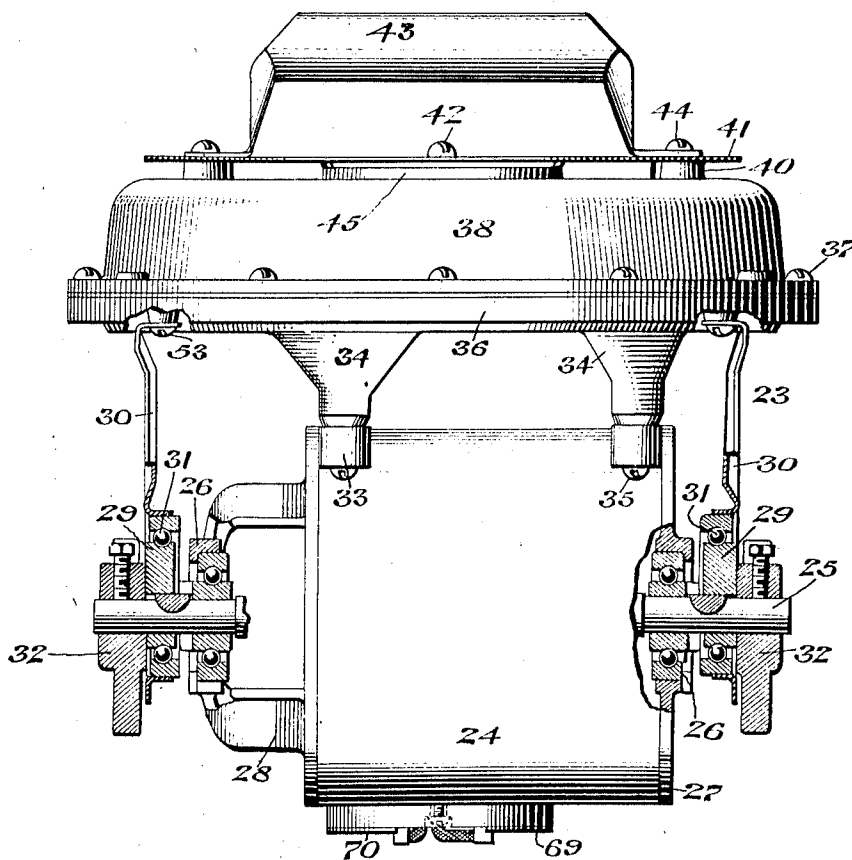
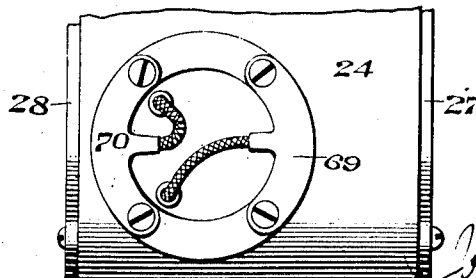


Fig. 3.



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UNITED STATES PATENT OFFICE.

JOHN W. SMITH, OF CHICAGO, ILLINOIS.

PNEUMATIC PUMPING APPARATUS FOR VACUUM-CLEANERS.

1,031,151.

Specification of Letters Patent.

Patented July 2, 1912.

Application filed May 15, 1909. Serial No. 496,254.

To all whom it may concern:

Be it known that I, JOHN W. SMITH, a citizen of the United States, residing at Chicago, in the county of Cook, State of Illinois, have invented a new and useful Pneumatic Pumping Apparatus for Vacuum-Cleaners, of which the following is a specification.

My invention consists of a novel construction of a pneumatic pumping apparatus which is specially designed to be employed in conjunction with vacuum cleaners, preferably of the portable type such as are employed in conjunction with an electric or other motor.

It is desirable in vacuum cleaners to produce a device which is as compact and as light in weight as is possible without decreasing the efficiency, and to arrange the various parts in such a manner that the operating mechanism is not liable to injury by anyone meddling therewith, and to the above ends I employ in my present device a pump unit wherein the motor and the pump are directly connected so that the same are inserted into and removed from the pump casing as a concrete unitary structure.

My invention further consists of a novel construction of a pump unit wherein the casing in which is located the pulsation chamber is directly connected with the motor casing, the movable member of the pumping mechanism being operatively connected with the motor shaft, and the casing of the pulsation chamber being provided with a suitable handle whereby the pump unit is rendered readily transportable, and whereby the same may be readily and quickly assembled or disassembled with respect to the pump casing.

It further consists of a novel construction of a pneumatic pumping apparatus wherein the casing is provided with suitable contacts on which are supported the contacts carried by the pump unit when the latter is inserted within the pump casing, said pump unit being removably secured within the pump casing.

It further consists of a novel construction of a pumping apparatus wherein the pump unit forms the sole means of separating the casing into a vacuum reservoir and a pressure reservoir, and wherein the motor carried by the pump unit is directly connected with the movable member of the pump.

In a co-pending application for portable

pneumatic pumping apparatus, Serial No. 435,633, filed May 29, 1908, I have described and broadly claimed a novel construction of a pump and in my present device it is the pump unit which forms the sole means of dividing the casing into a vacuum reservoir and a pressure reservoir, the pump being provided in a similar manner with an enlarged chamber whereby the pressure within the vacuum and pressure reservoirs will automatically vary in accordance with the load at the suction nozzle so that any kind of a relief valve is unnecessary and there is no danger of the motor of the pump unit being overloaded with consequent injury to the motor.

My invention further consists of a novel construction of a pneumatic pumping apparatus wherein a pump unit, consisting of a pulsation chamber and a motor directly connected with the pumping member of the pump unit, is inserted within a pump casing, the pulsation chamber being provided with an inlet valve at one end while the opposite end thereof is closed by the movable member of the pump, which is also provided with a valve controlled port, the outer valve having mounted thereabove a valve protecting member, and the pump unit being provided with a suitable actuating handle.

It further consists of other novel features of construction all as will be hereinafter fully set forth.

For the purpose of illustrating my invention I have shown in the accompanying drawings but one form thereof, since this embodiment has given satisfactory and reliable results in practice and is at present preferred by me, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of these instrumentalities as herein set forth.

Figure 1 represents an elevation partly in section of a pneumatic pumping apparatus embodying my invention. Fig. 2 represents a side elevation of the pump unit in detached position, certain parts thereof being broken away in order to more clearly show certain details of construction. Fig. 3 represents a bottom plan view of a portion of the pump unit showing more especially the contact plates.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings: in my co-
 pending application for portable pneumatic
 pumping apparatus, hereinbefore referred
 to, I have described and broadly claimed a
 novel construction of a pumping apparatus
 wherein the pumping mechanism is located
 within a pump casing to divide the same
 into a vacuum compartment and a pressure
 compartment and wherein the movable
 member of the pump is directly connected
 with the motor, and in my present device I
 show for purposes of illustration, a con-
 struction similar to many thousands now on
 the market and in practical use, wherein the
 pump and motor form a concrete structure
 which may be readily inserted into and re-
 moved from the pump casing.

1 designates a pump base which if de-
 sired may be provided in any suitable man-
 ner with rollers 2, preferably mounted in
 antifriction devices whereby the pump can
 be readily moved from one location to
 another.

3 designates an outer shell having any
 desired contour, although in the present
 instance I have preferred to show the same
 as being cylindrical.

4 designates an inner shell which is car-
 ried by the base 1 and intermediate the
 inner shell 4 and the outer shell 3 are lo-
 cated any desired number of layers of
 sound-deadening material 5 such as for ex-
 ample, felt, it being noted that the sound-
 deadening material is secured in position
 in the present instance in such a manner as
 to form an air space 6 between the inner
 layer of sound-deadening material and the
 inner shell 4. I preferably also employ an
 intermediate shell 7 which in the present
 instance I have shown as being located be-
 tween the two layers of sound-deadening
 material 5.

8 designates brackets secured to the outer
 shell 3 in any suitable manner, said brackets
 having pivoted thereto the threaded rods
 9 which latter are adapted to enter the
 slotted projections 10 so that by the em-
 ployment of suitable thumb screws or their
 equivalents 11, the cover 12 may be prop-
 erly secured with respect to the casing,
 which latter as will be evident is composed
 of the outer shell 3, the inner shell 4, the in-
 termediate shell 7, and the layers of sound-
 deadening material 5. The cover 12 is pro-
 vided with a suitable handle 13 whereby
 the pump may be readily transported from
 one place to another.

The outer shell 3, the inner shell 4 and
 the intermediate shell 7 are broken away or
 inwardly deflected to form a recess 14
 within which is contained a switch 15, it
 being seen that the wires 16 pass through
 the insulating tube 17 carried by the casing,

one of the wires 18 leading to the switch
 15 and therefrom to a contact member 19
 which is supported in any suitable manner,
 preferably on a resilient support 20 car-
 ried by the base 1, the other wire 21 lead-
 ing to the contact member 22 which latter
 is also suitably supported on the resilient
 cushion 20.

23 designates my novel construction of
 pump unit, the same comprising the motor
 casing 24 within which is located an electric
 motor, the shaft 25 of which is journaled in
 ball bearings 26 carried by the side pieces
 27 and 28 of the motor casing.

29 designates eccentrics mounted on the
 motor shaft 25 on opposite sides of the
 motor, said eccentrics having mounted there-
 on the connecting rods 30, it being under-
 stood from Fig. 2, that antifriction devices
 such as the ball bearings 31 are interposed
 between the eccentrics 29 and the connect-
 ing rods 30.

32 designates counterbalances adjustably
 mounted on the shaft 25 in proximity to the
 eccentrics 29. The motor casing 24 is pro-
 vided with lugs 33 on which are seated the
 side hangers 34, suitable fastening devices
 35 being provided for securing said hangers
 to the lugs 33. The hangers 34 are connect-
 ed with and preferably integral with an
 annulus 36 to which latter is secured by
 means of fastening devices 37 the casing 38
 which forms the upper portion of the pulsa-
 tion chamber 39. The upper portion of the
 casing 38 is provided with lugs 40 on which
 is mounted a valve protector 41 which is
 shown as consisting of an apertured mem-
 ber which is secured to the lugs 40 by suit-
 able fastening devices 42.

43 designates a handle which is secured
 to certain of the lugs 40 by means of suit-
 able fastening devices 44. The casing 38
 has at one end a spider 45 thereby forming
 an inlet port which is controlled by means
 of a valve disk 47 secured in place by means
 of a suitable fastening device 48, a washer
 49 being provided on one side of the valve
 47 and a washer 50 being provided on the
 opposite side of the valve 47 in order to give
 the valve the requisite stiffness, it being
 noted that the outer periphery of the valve
 47 is adapted to seat against the depending
 flange 51 carried by the casing 38.

52 designates a follower head to which is
 connected by means of suitable fastening de-
 vice 53 the connecting rods 30. The fol-
 lower head 52 is provided with a valve con-
 trolled port 54 therethrough which is con-
 trolled by means of a valve 55 centrally sup-
 ported by means of a suitable fastening de-
 vice 56, it being seen from Fig. 1 that
 washers 57 and 58 are provided on opposite
 sides of the valve 55 in order to give the
 same the desired stiffness at such point.

59 designates an annular member which

is secured to the inner shell 4 by means of suitable fastening devices 60, the upper face of said member in proximity to the shell being suitably recessed in order to receive a rubber or other gasket 61 on which the annular member 36 is adapted to be seated when the pump unit is inserted in place within the casing. The member 60 is provided with the reinforced flange 62 through which passes the screws 63, the same being held in position by means of the cotter pins 64, the upper end of the screws being adapted to pass through apertures in the members 36 and 38 and to receive the screws 65 whereby the pump unit is properly secured with respect to the annular member 59.

66 designates the diaphragm, the outer periphery of which is secured between the members 36 and 38 by means of the fastening devices 37, the inner periphery of said diaphragms being secured to the follower head 52 by means of the washer 67 and the fastening devices 68. When the pump unit has been inserted into the casing the contact 69 will engage with the contact 22 while the contact 70 will engage with the contact 19 so that the proper electric connection with the motor is provided. When the pump unit is located within the casing the pump thereof completely separates the same into a vacuum reservoir 71 and a pressure reservoir 72, the motor being located in the pressure reservoir.

Owing to the provision of the U-shaped gasket 73 an air tight joint is formed between the cover and the casing. The dust laden air enters through the inlet 74 which is adapted to be connected in any suitable manner with a suction hose, the dust laden air passing into the vacuum compartment 71 wherein the dust and foreign material is separated from the air by means of the filtering mechanism 75, the air passing through the inlet 46, controlled by the valve 47, into the pumping chamber 39, thence through the outlet port 54 from the pumping chamber into the pressure compartment 72 and thence through the muffler 76 to the discharge port 77 and to the atmosphere.

I wish to call particular attention to the novel construction and manner of assembling my device since the pump and motor form a unit structure which is provided with a suitable handle whereby the same can be readily removed from or inserted into the casing. When it is desired to take apart the device it is simply necessary to manipulate the fastening devices 11 whereupon the cover 12 may be removed, the filter mechanism taken out and then by simply actuating the fastening devices 65 the pump unit 23 may be bodily removed from the casing by means of the handle 43. It will also be apparent that when the pump unit is inserted in the casing owing to the provision of the contact

members 19 and 22 the proper electric connection will always be maintained between the motor and the wires leading to the casing.

In my present construction I have wholly obviated the necessity of employing any kind of a relief valve since the pulsation chamber 39 is so proportioned with respect to the vacuum reservoir 71 and the pressure reservoir 72 and there is no danger of the motor being overloaded and the entire amount of air displaced by the pumping mechanism must pass through the inlet 74, with consequent saving of efficiency. It will also be apparent that in my present construction when the cleaning nozzle is being applied to a heavy tightly woven carpet a small quantity of air can be pulled through the carpet at a high vacuum and in case the fabric to be cleaned is somewhat open a large volume of air will be supplied at a small vacuum so that in all cases met with in practice the pumping mechanism will have a very high efficiency.

It is essential in devices of this character that they be constructed in such a manner that they do not easily get out of order and so that no accidents may arise in cases where they are taken apart or assembled by unskilled operators and in my present construction there is no possibility of anyone becoming injured in any manner. Furthermore there is no danger of anyone injuring or becoming injured by the valves since the upper valve is properly protected by means of the apertured member 41, the latter also serving as a support for the bottom of the filtering mechanism.

It is to be noted that in the present application, in a manner similar to that already shown in my prior application to which I have hereinbefore referred, I show a direct connection between the motor and the pumping mechanism, since I employ a one-piece connecting rod preferably made out of pressed steel, one end of the rod being mounted on the eccentric carried by the motor shaft, while the opposite end thereof is rigidly secured to the movable member of the pumping mechanism.

I have deemed it necessary in the present instance to describe in detail the novel construction of the pump casing, whereby the pumping apparatus will be practically noiseless when in operation, since the same forms the subject matter of another application and forms *per se* no part of the operating mechanism of the pump.

It will now be apparent that I have devised a novel construction of a pumping apparatus which embodies the features of advantage enumerated as desirable in the foregoing and while I have, in the present instance, shown and described a preferred embodiment thereof, which in practice gives

very satisfactory results, it is to be understood that the same is susceptible of modifications in various particulars without departing from the spirit and scope of the invention or sacrificing any of its advantages.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a vacuum cleaner the combination of a casing having a ring secured intermediate its ends to the interior thereof, a pump and motor connected together both as to their stationary and as to their movable elements, and supported from the ring and also capable of removal from the casing as a unit.

2. In a vacuum cleaner, the combination of a casing having an internal ring secured intermediate its ends, a pump and motor

connected together both as to their stationary parts and movable parts, and supported from said ring, a packing between the movable unit and the ring whereby the casing is divided into a suction and pressure chamber.

3. In a vacuum cleaner, the combination of a cylindrical casing having an internal shoulder intermediate its ends, a pump circular in plan resting upon said ring and forming therewith a division of the casing, a motor secured to and depending from the pump and driving the displacing element thereof.

JOHN W. SMITH.

Witnesses:

F. A. RAUTENBERG,
G. C. ARMSTRONG.