April 30, 1935. D. G. SMELLIE 1,999,667

SUCTION CLEANER

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Fig. 1

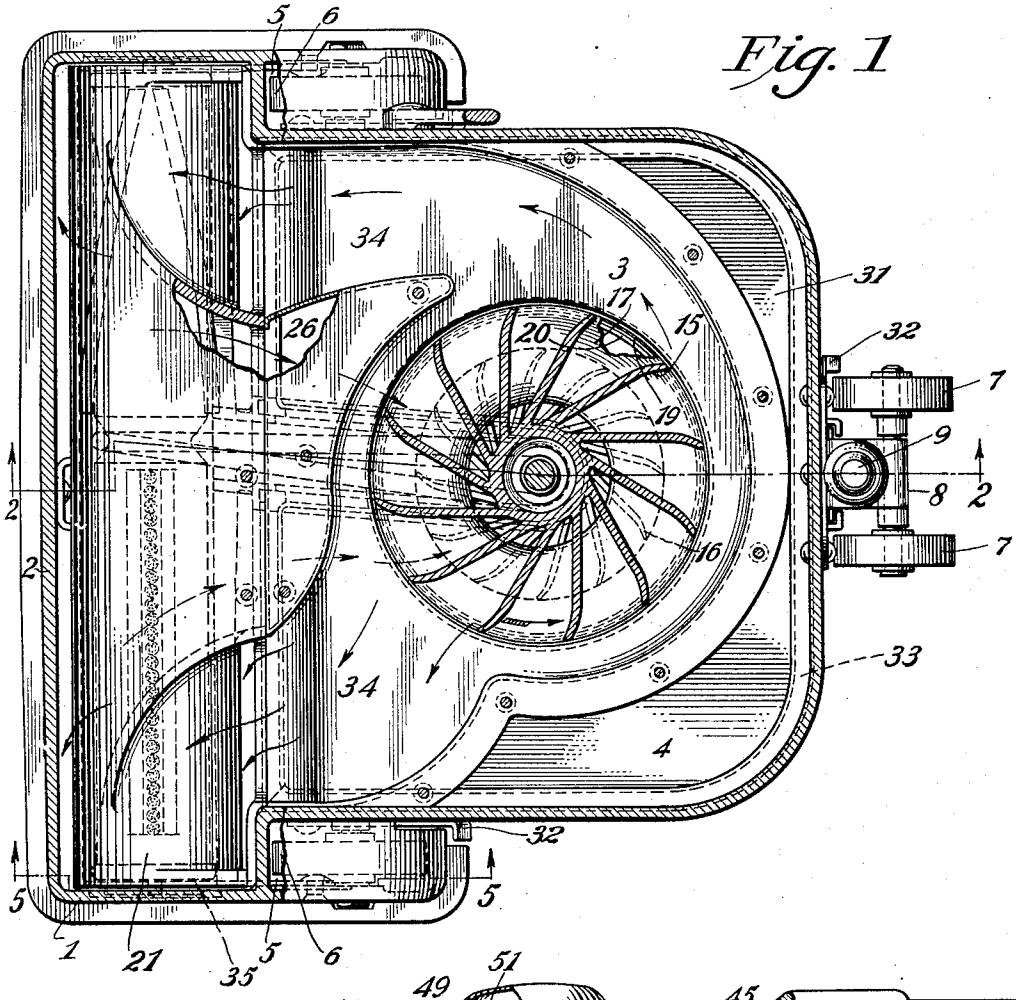
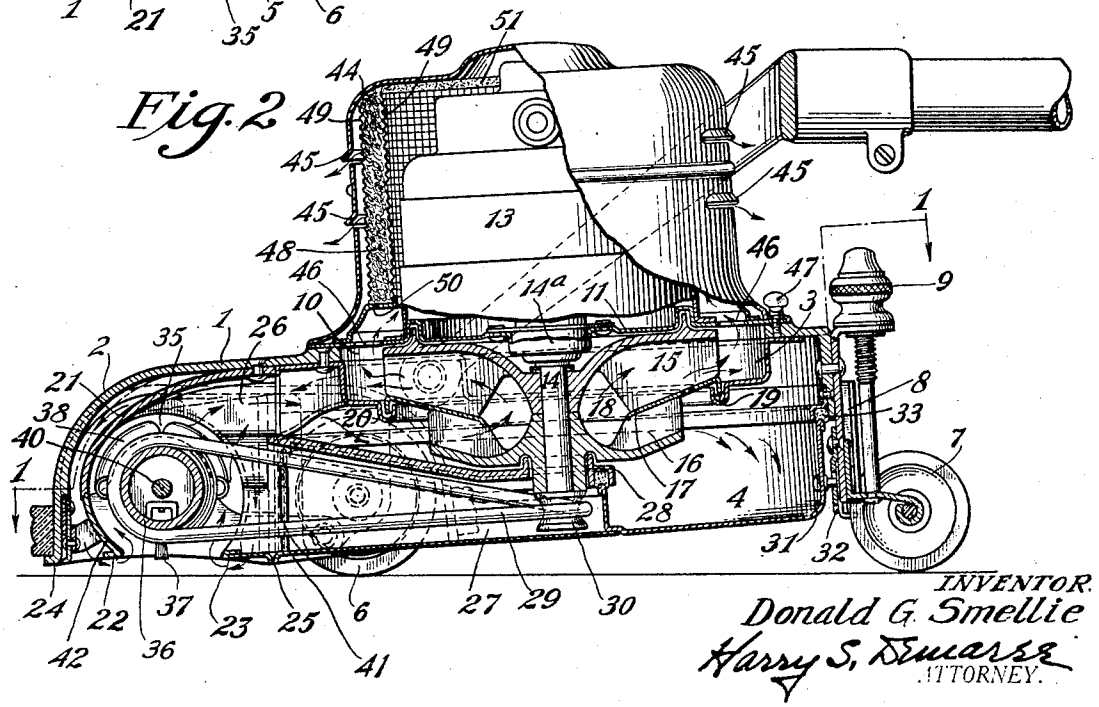


Fig. 2



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Fig. 3

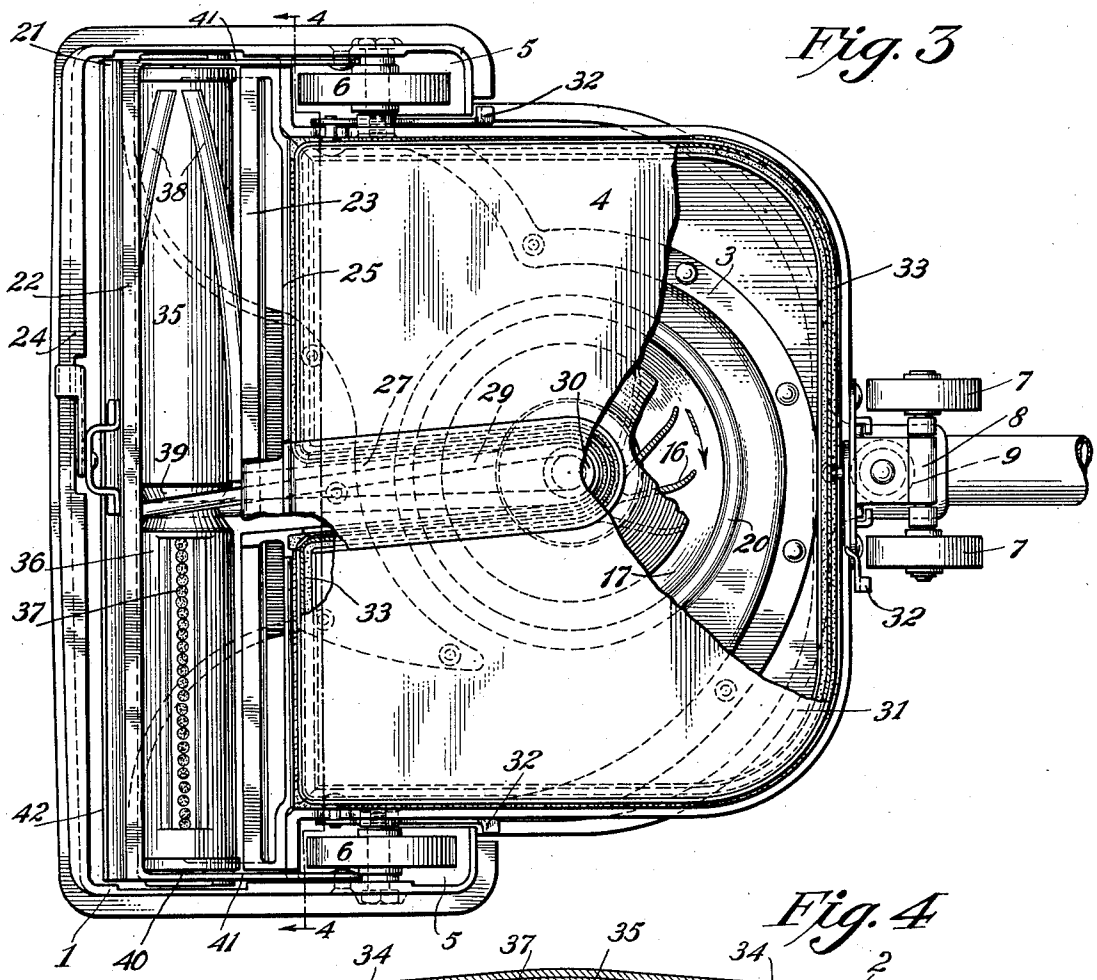


Fig. 4

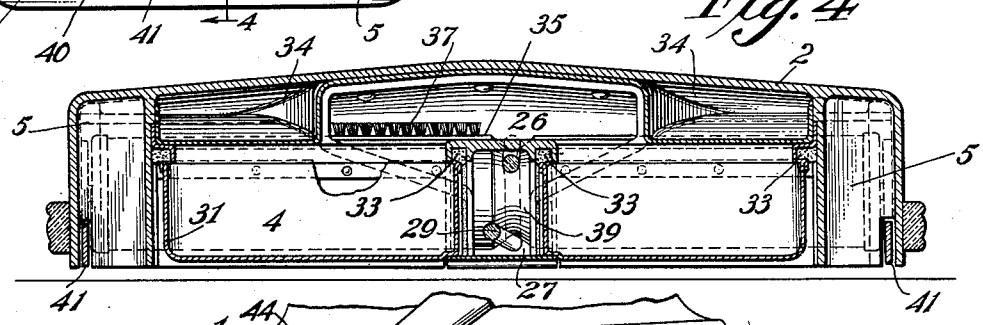
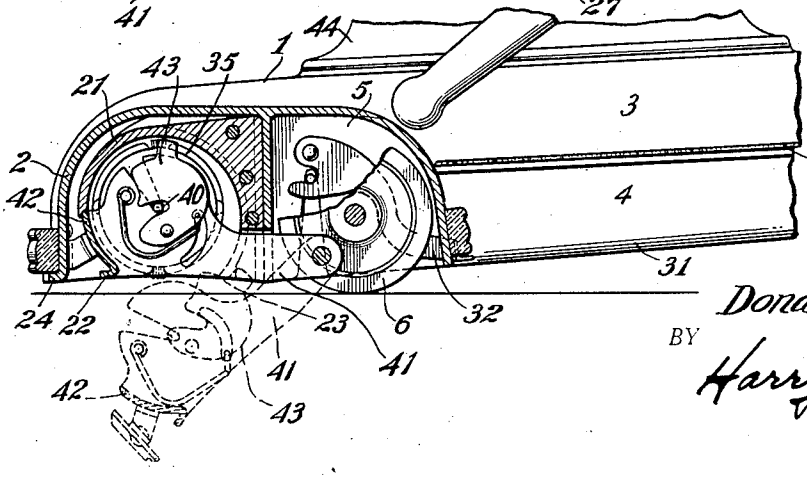


Fig. 5



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1,999,667

UNITED STATES PATENT OFFICE

1,999,667

SUCTION CLEANER

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Application April 23, 1932, Serial No. 607,044

7 Claims. (Cl. 15—14)

The present invention relates to suction cleaners in general and more particularly to a new and improved suction cleaner construction in which the usual dust bag is not necessary. More specifically the invention comprises what is commonly known as a closed circuit suction cleaner.

In the usual suction cleaner construction the dust bag, ordinarily made of a fabric and suspended from the pivoted handle of the machine and attached to the exhaust outlet of the fan chamber, is a well known part and is generally accepted as a necessary evil. The accepted function of a suction cleaner is to remove foreign matter from a surface covering in order to clean it and heretofore successful suction cleaners operating without the dust bag have not been made. In the most efficient cleaners the surface covering is agitated by some form of agitating means to dislodge the embedded foreign matter and swiftly moving air is drawn through and over the covering by suction-creating means to remove it. In the usual cleaner this dirt-laden air is drawn through a nozzle, into a fan chamber, and then exhausted from the fan chamber into the dust bag where the suspended foreign matter is removed from the air which itself passes through the fabric of the bag to the exterior atmosphere. Closed circuit machines have been made in which relatively high percentages of the suspended foreign matter in the cleaning air have been removed without the use of dust bags. Such machines, however, have always permitted the escape into the room of a small percentage of the foreign matter carried by the cleaning air and, unfortunately, it is in this small percentage of escaping matter that the light dust which is most noticeable to the user of the machine, because it floats in suspension in the air which he or she breathes, belongs. If the small percentage of the foreign matter which escaped from the usual closed circuit machine was of the relatively heavy type which would not float in air it would not be objectionable to the user and such machines might be commercially successful. Such is not the case, however, and heretofore closed circuit machines have been considered impractical for commercial use. The reason for the escape into the surrounding atmosphere of a certain percentage of the dirt-laden air which passes through a closed circuit machine is quite clear. If the machine could be absolutely sealed from the exterior atmosphere so that the same air would pass continuously through the nozzle, through the separator, through the fan chamber and back again into the nozzle, no escape of removed foreign matter would take place. Such is not the case, however. Additional air is continuously being drawn into the air stream of the cleaner at the cleaner nozzle where it contacts the surface covering. As new air is drawn into the air circuit it necessarily replaces a like volume of air which carries in itself suspended foreign matter. This air also escapes at the suction nozzle mouth in the usual closed circuit machine. In the closed circuit suction cleaner constructed in accordance with the present invention means have been provided to eliminate the escape of dirt-laden air from the suction cleaner or, more accurately speaking, means have been provided to remove the suspended foreign matter entirely from this escaping air.

It is an object of the present invention, therefore, to provide a new improved closed circuit suction cleaner. It is a further object to provide a new and improved closed circuit suction cleaner in which a filtered escape or leak is provided for replaced air in the cleaner circuit. Still another object is the provision, in a closed circuit suction cleaner, of a mechanical separator to remove the suspended foreign matter from the cleaning air, and additional separating means to remove the foreign matter from the air which escapes from the cleaner circuit upon being replaced by additional air from the exterior atmosphere. These and other more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith the attached drawings to which they relate.

In the drawings in which a preferred embodiment of the present invention is disclosed:

Figure 1 discloses an embodiment of the present invention, being a section taken upon the line 1—1 of Figure 2;

Figure 2 is a section upon the line 2—2 of Figure 1;

Figure 3 is a bottom view of the cleaner shown in Figures 1 and 2 with a portion of the dirt container broken away;

Figure 4 is a section upon the line 4—4 of Figure 3;

Figure 5 is a section upon the line 5—5 of Figure 1.

Referring again to the drawings a closed circuit suction cleaner is shown which comprises a main casing 1 which includes the nozzle casing 2 and the combined fan chamber and dirt receptacle which are indicated by the reference characters 3 and 4, respectively. Wheel pockets 5, 5 are provided in the main casing within which the front supporting wheels 6, 6 are positioned while at

the back of the main casing the rear casters, indicated by the reference characters 7, 7 are carried by a support 8 which is connected to the main casting, there being height-adjusting means 9, through the use of which the rear casters can be raised and lowered in order to vary the relationship of the cleaner nozzle to the surface covering undergoing cleaning.

The main casing is provided with a circular aperture 10 in its top surface which is closed by the motor bottom plate 11 which, in turn, supports the motor casing 13 of the cleaner motor, the motor shaft 14 being rotatably mounted in the bearing 14a carried by the motor bottom plate. The main body of the cleaner in the rear of the nozzle, as before indicated, is divided into a fan chamber 3 and a dust receptacle 4. Within the fan chamber and carried by the motor shaft 14 is the suction-creating fan 15 while immediately below the fan, and also carried by the shaft, is the dust separator 16 through which the air must pass in response to the draft created by the suction-creating fan. A frusto-conical plate 17 separates the fan from the separator and provides a central opening 18 through which the cleaning air may pass from the dust chamber into the fan chamber, the opening being in fact the eye of the fan chamber. Plate 17 is provided at its periphery with a downwardly extended circular flange 19 which cooperates with a circular groove 20 in the surrounding edge of the fan chamber to effectively prevent the leakage of air from the dirt container into the fan chamber.

Within the nozzle casing of the cleaner is the nozzle proper 21 which is provided with the surface-contacting lips 22 and 23 which define the nozzle mouth and which are spaced between the front and rear lips 24 and 25 of the nozzle casing. Nozzle 21 is interiorly connected by the passageway 26 to the dust chamber 4. A channel 27 extends rearwardly from nozzle 21 into chamber 4 to a point immediately below the motor shaft 14 where it is provided with a circular opening 28 in its upper surface through which the motor shaft extends. This channel forms a suitable belt passageway for the power-transmitting belt 29 which runs on the pulley 30 on the lower end of the motor shaft. The bottom of the belt passageway 27 as well as the bottom of the entire dirt container 4 is formed by the removable bottom pan or plate 31 which is secured to the main body 1 by means of suitable locking means 32, 32, 32 positioned at the sides and rear of the said bottom member and which are manually operable. A seal 33 is provided at the line of contact of the bottom plate 31 with the main casing of the machine to prevent any leakage of air from the interior to the exterior thereof.

The fan chamber 3 is connected through its exhaust outlets 34, 34 to the space between the nozzle casing 2 and the nozzle proper 21 and the air exhausted through the said exhaust passageways circulates around the nozzle proper and under the lips thereof and into that member in response to the suction created by the fan 15 which is effective through the dirt container and passageway 26.

Within the nozzle proper 21 is rotatably mounted a surface-contacting agitator 35 which comprises a body 36, a brush 37, and positive beating elements 38, 38. A pulley 39 is positioned substantially in the middle of the agitator body at the forward end of the channel 27 in such position that it can be operatively associated by the belt 29 with the pulley 30 on the motor shaft. The agitator is rotatably mounted upon the longitudinally extending shaft 40 which is itself removably seated at each end within a side arm 41 of the frame 42 by the spring-pressed cam member 43 carried thereby. The side members, 41, 41 are pivotally mounted in the rear of the nozzle proper in the wheel pockets 5, 5 and the agitator can be removed by pivoting the frame downwardly to the position shown in Figure 5.

Surrounding casing 13 of the cleaner motor and spaced therefrom is the false motor housing 44 which is provided with spaced louvers 45, 45. The motor bottom plate 11 is provided with relatively small apertures 46, 46 which connect the space between the motor casing and the false motor housing with the interior of the fan chamber, the motor housing being removably held in place by means of thumb screws, of which one is indicated by the reference character 47. Within the false motor housing, and between the openings 46, 46 in the motor bottom plate and louvers 45, 45 in the false motor housing, is the filter member 48 comprising a central air-permeable filter which is reenforced by side members 49, 49. The filter is supported upon a seat 50 which itself is carried by the upper surface of the motor bottom plate, the said filter being securely held thereon by the false motor housing which is provided with a circular gasket or seal 51 at its top which contacts the top of the filter and forces it against its seat when it is in position on the chamber.

In the operation of the cleaner constructed in accordance with the present invention cleaning air is drawn into the nozzle proper 21, through the passageway 26 and into the dirt container 4 in response to the suction created by the suction-creating fan 15. The air so drawn must first pass through the separator 16 in gaining entrance to the eye 18 of the fan and in passing through this member the suspended foreign matter therein will be separated therefrom, in the usual and well known manner, and will be thrown radially outward to collect in the bottom of the dust container. The action of separator removes a large percentage of the foreign matter suspended in the air. The air after leaving the separator enters the fan chamber 3 by way of fan 15 and is exhausted by the fan through the exhaust openings 34, 34 and into the main nozzle casing surrounding the nozzle proper. The surface covering has been lifted by the suction within the nozzle proper into contact with all the lips and the air which is between the nozzle proper and the nozzle casing walls enters the nozzle proper 21 under the lips 22 and 23. A certain amount of air, however, will leak under the lips 24 and 25 of the main nozzle and at the ends and will therefore increase the volume of air present within the cleaner unless a corresponding volume of air is displaced therefrom. In the usual closed circuit machine the displaced air would be forced out under the main nozzle lips but in the cleaner constructed in accordance with the present invention this displaced air is scientifically disposed of. According to the present invention a volume of air equivalent to that which leaks into the circuit under the nozzle lips passes from the fan chamber 3 through the openings 46, 46, in the motor bottom plate 11, into the space between the main motor casing 13 and the false motor housing 44 and is exhausted through the louvers 45, 45 in that housing, having first passed through the filter 48 which removes substantially all of the remaining suspended foreign mat-

ter therein. By this provision of means to accommodate the escape of the displaced air there is no discharge into the room of finely divided and floating particles which would be inhaled by and objectionable to the operator.

After continued use of the machine the filter **46** will in time require replacement in which event it is only necessary for the operator to loosen the screws **47** and remove the false motor housing **44** after which it is a simple matter to remove the filter. A filter can be cleaned many times and replaced, and upon the necessity arising, a new filter substituted at a relatively small cost.

I claim:

1. In combination in a bagless suction cleaner, a nozzle, suction-creating means to draw cleaning air through said nozzle, mechanical means to remove the suspended foreign matter from the cleaning air moved by said suction-creating means, a dirt receiver to receive foreign matter removed by said separator, means to guide the air exhausted by said suction-creating means to the inlet of said nozzle, and means for the escape of excess air from said cleaner to the exterior atmosphere including a passage open to the exhaust of said suction-creating means and an air-permeable filter in said passage through which the air escaping through said passage must pass.

2. A closed circuit bagless suction cleaner including a nozzle, a fan, a mechanical separator, and means to convey air in said cleaner from said nozzle, through said fan and separator, and back to said nozzle, characterized by the fact that there is provided a leak passageway open to said means and to the exterior atmosphere to permit the escape of air, and a filter in said passageway to remove foreign matter from the escaping air.

3. A closed circuit bagless suction cleaner including a nozzle, a suction-creating fan, a dirt separator and means to convey air in said cleaner from said nozzle, through said fan and separator and back to said nozzle, characterized by the fact that there is provided a leak passageway open to said means and to the exterior atmosphere to permit the escape of air, a removable stationary filter in said passageway to remove foreign matter from the escaping air, said passageway including manually operable means securing said filter in place.

4. In a suction cleaner, a nozzle including spaced surface-contacting lips, a mechanical dirt separator, a suction-creating fan, a driving motor operatively connected to said separator and fan, means to convey air from said nozzle to said separator and fan and back to said nozzle including an open-ended passageway adjacent a lip of said nozzle, and means to convey to the exterior of the cleaner any excess of air caused by leakage of atmospheric air into said nozzle, said means including a perforated casing around said driving motor interiorly connected to said first-mentioned means, and a filter between the perforations in said casing and said first-mentioned means.

5. In a suction cleaner, a nozzle including spaced surface-contacting lips, a mechanical dirt separator, a suction-creating fan, a driving motor operatively connected to said separator and fan and including an enclosing casing, means to convey air from said nozzle to said separator and fan and back to said nozzle including an open-ended passageway adjacent a lip of said nozzle, and means to convey to the exterior of the cleaner any excess of air caused by leakage of atmospheric air into said nozzle, said means including a removable casing surrounding and spaced from said motor casing and having an opening therein, said first-mentioned means provided with an opening into the space between said casings, and a filter in said removable casing through which air must pass in leaving said casing.

6. In a closed circuit bagless suction cleaner, a nozzle, suction-creating means, a mechanical dirt separator, means to convey air from the nozzle to said suction-creating means and separator and back to said nozzle, and a leak of relatively small capacity as compared with the air handled by said suction-creating means in the return circuit of said air-conveying means, and a filter in said leak thru which escaping air must pass, said leak functioning to permit the escape of excess air drawn into said nozzle.

7. In a closed circuit bagless suction cleaner, suction-creating means, a mechanical dirt separator, means to convey air from said nozzle to the low pressure side of said suction-creating means, and means to convey air from the high pressure side of said suction-creating means back to said nozzle, and a leak for said last mentioned conveying means including a filter to permit the escape of surplus air from said conveying means and to remove suspended matter therefrom.

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