

May 6, 1930.

A. O. ENGBERG ET AL

1,757,239

CLEANING AND AIR CONDITIONING APPARATUS

Filed June 15, 1926

3 Sheets-Sheet 1

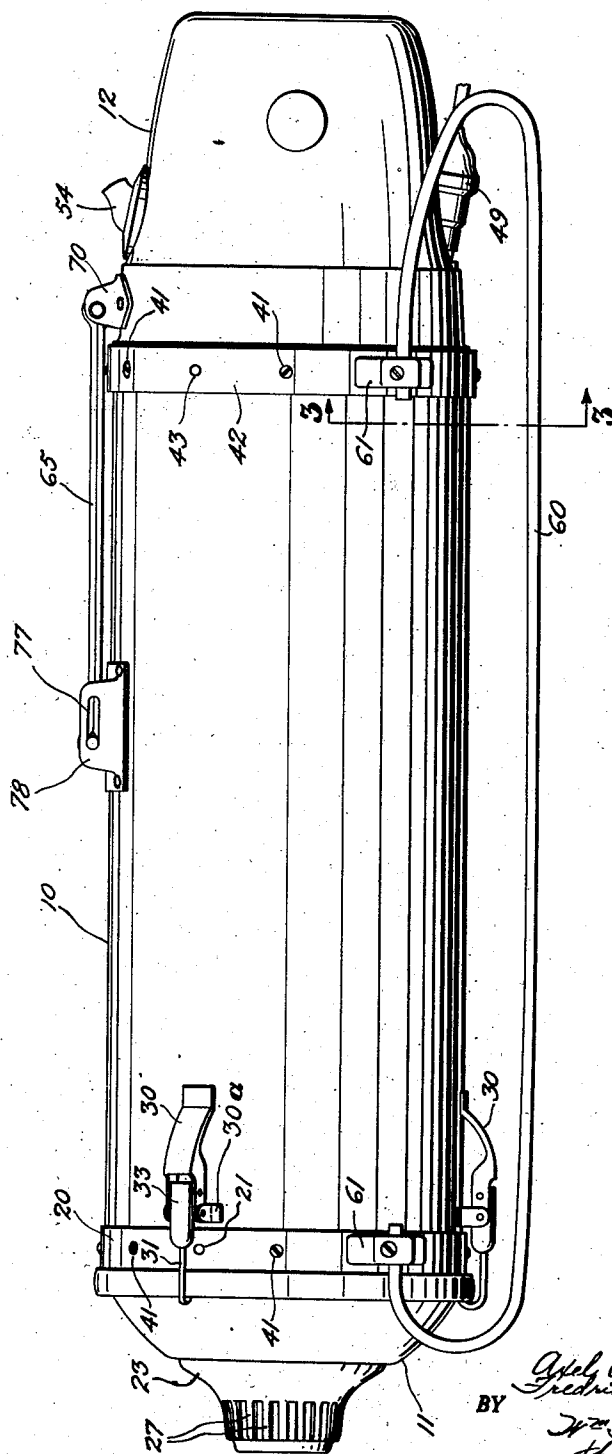


FIG. 1.

INVENTORS

BY

W. J. Hedlund
ATTORNEY

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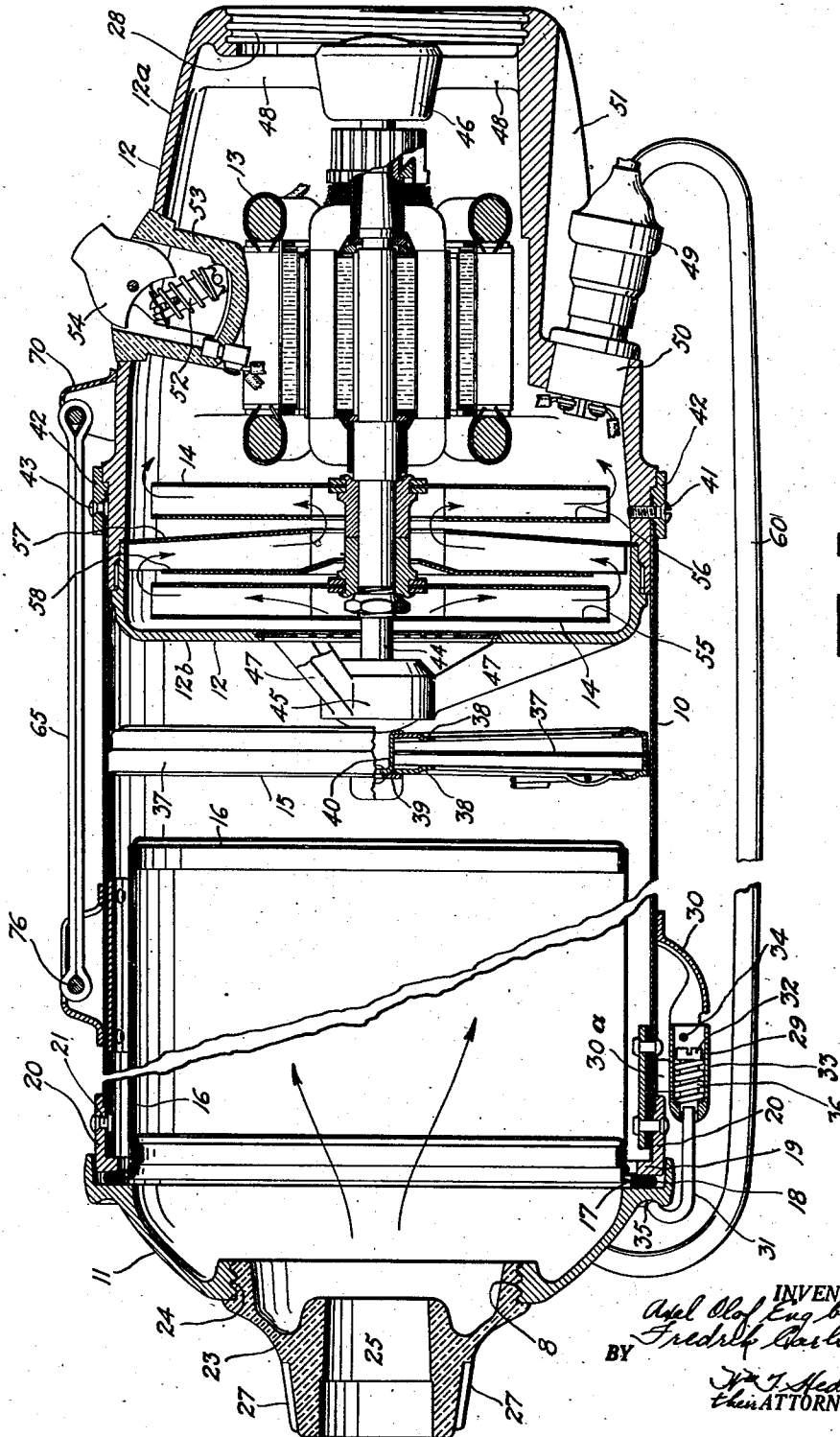


FIG. 2.

INVENTORS
A. O. Engberg
Fredrick Carlstedt
BY
J. J. Hedlund
ATTORNEY

May 6, 1930.

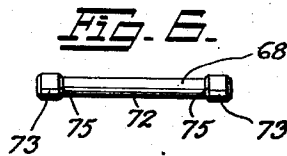
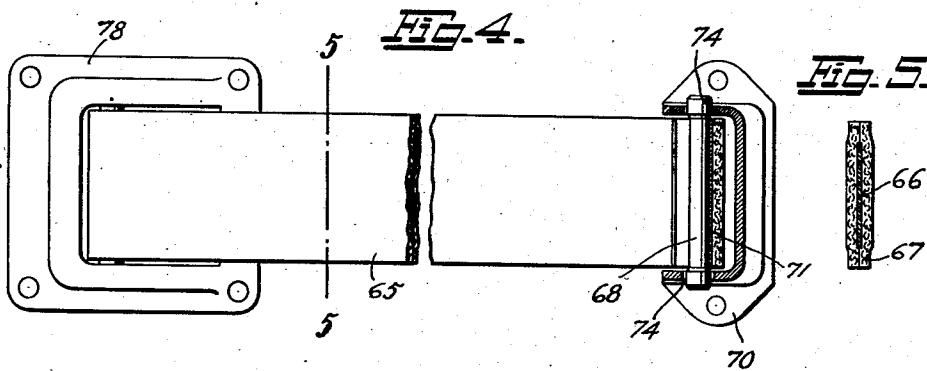
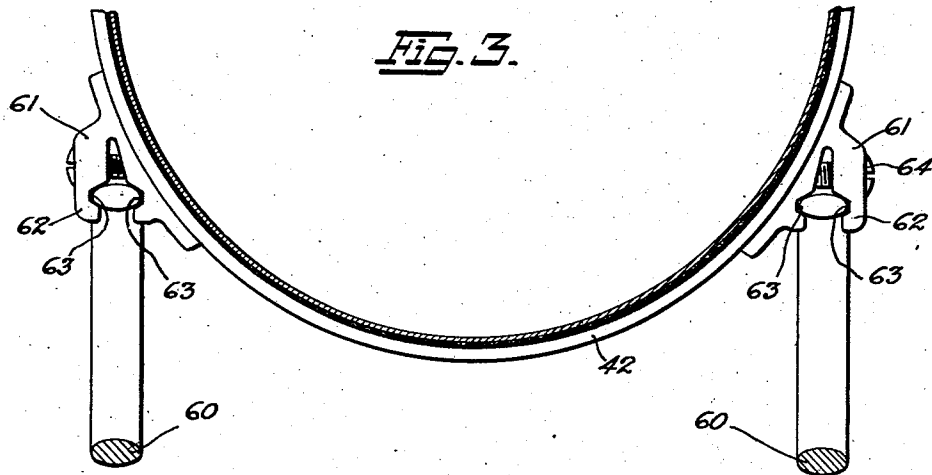
A. O. ENGBERG ET AL

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3 Sheets-Sheet 3



INVENTORS
A. O. Engberg
Fredrik Carlstedt
BY
H. J. Hedlund
ATTORNEY

UNITED STATES PATENT OFFICE

AXEL OLOF ENGBERG AND FREDRIK CARLSTEDT, OF STOCKHOLM, SWEDEN, ASSIGNORS TO INVENTIA PATENT-VERWERTUNGS-GESELLSCHAFT, OF SCHAFFHAUSEN, SWITZERLAND, A CORPORATION OF SWITZERLAND

CLEANING AND AIR-CONDITIONING APPARATUS

Application filed June 15, 1926, Serial No. 116,123, and in Sweden December 16, 1925.

Our invention relates to cleaners of the type wherein a current of air is employed. More particularly our invention relates to cleaners of the type generally known as vacuum cleaners. Our cleaner is, however, not alone a vacuum cleaner, that is one which induces the air containing the dust and dirt, but is also a blower by means of which a forced current of air can be projected against a place to be cleaned.

One object of our invention is to produce a cleaner unit which can easily be converted from a vacuum cleaner to a suitable blower. Other objects of our invention are: to provide a neat, compact, easily portable, cleaner, easy to manipulate and yet powerful in cleaning effect; to provide a combined hose coupling and insulator adapted to facilitate transference of the cleaner from evacuating to blowing operation as above stated; to provide means for obtaining efficient flow of air both during suction and blowing action and to provide such means without sacrificing convenience in use.

Further objects and the nature of our invention will be apparent as the description proceeds. The description is of one preferred form but it is to be understood that it is not intended that the invention be limited to the form described.

Referring to the accompanying drawings which illustrate the preferred form of our cleaner: Fig. 1 is a side view of the main unit of the cleaner showing the same assembled, this main unit containing the fan, motor and dust bag and adapted for connection with an air hose or similar conductor of air through which the air passes and to which a cleaning nozzle or mouthpiece may be attached; Fig. 2 is a longitudinal section of the so-called main unit; Fig. 3 is a section on line 3—3 of Fig. 1, with internal parts of the unit omitted; Fig. 4 is partly a plan view and partly a sectional view of a strap for carrying the main unit; Fig. 5 is a section

on line 5—5, Fig. 4; Fig. 6 shows a pin normally arranged at one end of the strap; Fig. 7 shows a spring member also forming part of the strap arrangement; and Fig. 8 shows the cleaner in operation.

The main unit of the cleaner, shown in side view in Fig. 1 and section in Fig. 2, comprises a casing, in turn comprising a main cylindrical barrel 10 consisting of stiff material such as thin sheet metal surrounded by fibrous material or leather composition having attached thereto at one end a metal bell 11, and, at the other end, a metal housing 12. Housing 12 contains the electric motor 13 and the fan 14. Forward of housing 12, that is, in direction toward bell 11, is a disinfecting air filter 15 and forward of the filter 15 is the dust bag 16. The forward end of the dust bag consists of a flanged metal ring 17, around the flange of which is placed a rubber washer 18. The flange of ring 17 and the rubber washer 18 are clamped between bell 11 and the flange 19 of a circular ring 20 attached to the forward end of the main barrel by means of rivets 21 and forming part of the main barrel.

A central coupling 23 is screw-threaded into a central opening 8 in bell 11 by means of threads 24 and has a central tapered passageway 25 into which, in normal operation, the tapered end of a flexible metal air hose 26 is jammed, which air hose leads to the mouthpiece 22 into which the dust passes, an extension 9 (Fig. 8) being used between the mouthpiece and the air hose, if desired. Coupling 23 is readily removable from bell 11 by mere turning of the hand and for this purpose is supplied with a roughened surface in the form of ribs 27 to provide an easy grasp.

In normal operation air containing dust passes in through passageway 25 from tube 26 and mouthpiece 22 and into dust bag 16 where the dust is deposited, and from which the air, after passing through the cloth of the dust bag, passes through the filter 15,

thence through fan 14 and out to the atmosphere through opening 28 at the rear end of housing 12. Opening 8 may be considered as the air inlet and opening 28 as the air outlet for the unit.

The dust bag, of which the main portion is preferably made of cloth, is attached to ring 17 in any desired manner. The dust bag can be removed from the barrel, to expel the dust collected within the same, by first unclamping and removing bell 11, after which the dust bag is drawn forward through the forward end opening of the barrel formed by ring 20. As preferred means for clamping bell 11 to the main barrel there are used a series of spring clamps 29 which comprise a lever 30 pivoted to a bracket 30^a which is fastened to the barrel, a hook 31, a bolt 32, a sleeve 33 and a spring 36 extending between the head of the bolt and an abutment on the sleeve. The sleeve is pivoted at 34. The hook 31 rests on a shoulder 35 on bell 11. Bell 11 is unclamped by pulling lever 30 away from the barrel, whereby the spring 36 is released and the hook 31 can be removed from the shoulder 35 on bell 11.

The filter 15 comprises a filter pad 37 which consists of cloth impregnated with a suitable disinfectant. This filter pad is clamped between two metal disks 38 by means of parts 39 and 40 of which part 40 is secured to one disk and part 39 can be turned by hand to register with a hole in the other disk in one position and overlap the disk in another position.

It will be noted that the motor and fan are enclosed in one unitary structure, namely housing 12. One purpose of thus forming one unitary structure including the revolving parts is to obtain a unit which can be made separately from other parts of the cleaner and can be set up and inspected of itself. Furthermore this arrangement permits making the remaining parts such as the main barrel of light material and is of advantage because if in transportation or at any other time the main barrel should become injured the unitary motor-fan structure can be removed and a new barrel readily attached. In order that the motor-fan unit may be readily detached from the barrel it is secured to the barrel by means of screws 41 which are accessible and removable from outside the main cleaner unit as a whole. A ring 42 is fastened to the rear end of the main barrel by means of rivets 43. The motor-fan housing 12 is machined to fit within ring 42 and the barrel. The screws 41 pass through ring 42, through the barrel, and thread into the motor-fan housing. By merely removing screws 41 and detaching the strap 65 by a simple manipulation, which will be presently described, the unitary housing 12 may be detached from the main barrel, thereby separating those parts which may be termed active from those parts which may be termed inactive,

without interference with electric connections nor mountings nor mouthpiece connections, and without any mechanical dismantling, nor necessitating the services of a mechanic.

Furthermore, the formation of a single unitary structure enclosing the motor and fan is advantageous in standardization of manufacture because this motor-fan unit contains all the parts which require careful machine work. It is therefore possible to devote one portion of a plant to the manufacture of this unit and to devote a separate portion of the plant or even a different plant to the manufacture of remaining parts while a ready assemblage can be made at any place, proximate or remote. The quality of labor employed can thus be apportioned to effect a most efficient standardization.

Housing 12 is made of two parts 12^a and 12^b which may be secured in any desired manner, but preferably so that they may be readily separated.

The motor and fan are mounted upon a common rotatable shaft 44. Shaft 44 is mounted in bearings 45 and 46. Bearing 45 is supported from the main housing 12 by means of struts 47. Bearing 46 is supported from the main housing 12 by means of struts 48.

Plug 49, to which a cord adaptable of attachment to an electric circuit is attached, fits into a socket 50 which is secured in an opening in the housing 12 and so arranged that plug 49 is situated in a recess 51. The purpose of the recess is to protect the plug 49 and to give a smooth, more or less stream line contour to the main unit of the cleaner as a whole, thus preventing possibility of injury to parts and affording a neat appearance. Electric connections extend between socket 50 and the motor 13 in known manner. In the electric circuit is a switch 52 which serves to make or break the circuit. This switch 52 is also arranged with a view to obtaining a smooth contour of the cleaner and to prevent injury to parts. The switch is set into the housing 12 in a well 53 in such a manner that only a small part 54 extends outside the housing which part is adapted to be moved by hand or foot to make or break the motor circuit.

Fan 14 is a two stage centrifugal fan comprising two rotatable wheels 55 and 56 and intermediate diaphragms 57 and 58. Each wheel comprises two disks between which are curved vanes, as is common in centrifuges. Upon rotation of the motor, air passes through the fan in the direction of the arrows.

The central coupling 23 serves two purposes: first, it serves to prevent transmission of electricity from the main parts of the cleaner to the hose 26 and thus to the body of the operator, and for this purpose, is made of non-conducting material, preferably ebonite;

and second, it serves to make the cleaner reversible and transform the same from a vacuum cleaner into a blower. The reason for making coupling 23 of non-conducting material is that it might happen that parts become short circuited and this member serves to prevent a shock to the person operating the cleaner. For the second purpose mentioned, namely, to transform the vacuum cleaner into a blower, the rear opening 28 in housing 12 is made of the same size and with the same number of threads per inch as the opening in bell 11 in which coupling 23 is shown as inserted.

If it is desired to use the cleaner to blow air, coupling 23 is removed from the opening 8 in bell 11 and screwed into opening 28. Hose 26 may then be fitted into coupling 23 with or without the attachment of a mouth-piece. In this operation it is obviously preferable to remove the dust bag. Upon switching on the current, air is then drawn in through the opening 8 in bell 11, through the main barrel, through fan 14, past motor 13 and out through opening 28 to form the ventilating or blowing current. Openings 8 and 28 may be said to be in the end walls of the casing.

The opening 28 and the corresponding opening 8 in bell 11 are made considerably larger than the opening 25. The purpose of this construction is to reduce the friction and throttling losses. If the opening 8 in bell 11 were as small as opening 25, a considerable resistance would result for the air flowing through this opening 8 when coupling 23 is inserted in opening 28 and the apparatus is used as a blower. Also, in normal evacuating operation, it is preferable to have a large air outlet, in order to avoid resistance on the outlet side of the fan and accompanying loss in efficiency.

The main barrel 10 and associated parts are mounted upon runners 60, of which there are two, one positioned on either side of the main barrel, and which form a sled carriage for the main unit. The runners are fastened at each end of the main barrel to clamps 61. Clamps 61 may be cast in one piece with rings 20 and 42. Each clamp comprises a curved portion which is fitted to and clamped on to the ring and a somewhat flexible lip 62 (see Fig. 3). These two parts are provided with recesses 63 into which the runner is adapted to set. The runner is slipped into recesses 63 and secured by means of screw 64 which serves to move lip 62 toward the circular portion of the clamp which is attached to the outer ring of the main barrel.

Runners 60 are made oval in cross-section. This gives a greater strength for a given cross-section of runner, provides better sliding qualities, gives a neat appearance and, furthermore, prevents rotation of the runners. Recesses 63 can be shaped so there is

no possibility of the runner turning in the same and thus dislocation of the runners is prevented.

The runners extend from the clamps outwardly beyond the main barrel 10 and then return underneath the barrel slightly curved which makes the sliding and the turning of the unit on a carpet easier. The outward curvature of the runners is of particular importance as regards the rear end of the cleaner since the runner here serves as a protection for plug 49.

Clamps 61 are attached to the main barrel at points below the center line of the same. By this means the runners are moved underneath the barrel and are not exposed. This facilitates packing and prevents damage to the runners.

In order to carry the main cleaner unit comprising the main barrel 10 and attached parts a strap 65 is provided. This strap consists of a central flat steel spring 66 which is surrounded by cloth or leather or other suitable material 67 (see Figs. 4 and 5). The strap at one end surrounds a pin 68 which is mounted in a standard 70. Standard 70 is attached to the housing 12. Between the strap 65 and pin 68 is a metal member 71 (Fig. 7) of yieldable nature. Pin 68 has a central portion 72 over which metal member 71 fits and two end portions 73 of greater diameter than the central portion 72 and of greater diameter than the unsprung natural internal diameter of metal member 71. Portions 73 fit into openings 74 in standard 70. Pin 68 is provided with bevelled portions 75 which normally are adjacent the ends of metal member 71. Pin 68 in normal position, extends somewhat outside the part of standard 70 in which it is situated. The purpose of the arrangement just now described is to allow, by very simple means, a quick release of strap 65 from standard 70 so that the motor-fan housing 12 to which standard 70 is attached can be readily removed from the main barrel 10 to which the other end of strap 65 is secured. By pressing either end of pin 68 bevels 75 cause members 71 to spring outwardly and the end portions 73 slip inside members 71. Upon movement of pin 68 within standard 70 the strap can be twisted and removed from standard 70. For this purpose the holes in which parts 73 normally rest are made large enough to afford clearance for the passage of that portion 73 which has been moved outwardly from standard 70, through the hole, in oblique position.

The forward end of strap 65 encircles pin 76. This pin is adapted to move longitudinally of the main barrel 10 by having its ends resting in slots 77 in the sides of a forward standard 78. The spring characteristic of member 66 tends always to hold strap 65 down against or near to the main barrel with pin 76 in its forward position. In order to

carry the cleaner unit, strap 65 is lifted whereupon pin 76 slides to its rearmost position and the strap then has a convenient bowed position to form a handle. The strap is arranged so that its center is substantially above the center of gravity of the cleaner unit comprising barrel 10 and connected parts, whereby the cleaner unit may be carried in horizontal position.

From the above description it is readily seen that an apparatus has been produced which is particularly adapted to transportation in that there are no exposed parts which are liable to injury. In view of the compactness of the arrangement, a great number of the main units can be packed in a relatively small container and as has been seen, the remaining parts take up very little room.

Obviously different arrangements of parts may be used and parts may be modified without departing from the sphere or scope of the invention. Furthermore it is obvious that parts of the novel cleaner herein described may be used without use of remaining parts without departing from the scope of the invention. The invention is not to be limited to the detailed description of the specification which has been drawn with a view of setting out one example completely to enable those skilled in the art to readily make and use the invention, but is to be limited merely by the state of the prior art and the scope of the appended claims.

As one example of an obvious change that may be made, we wish to point out that the coupling openings, that is the air inlet and outlet, need not be made coaxial with the main barrel.

Having thus described our invention, what we claim is:—

1. A cleaner comprising a casing of generally cylindrical formation, a shaft mounted axially in said casing, a fan and a motor mounted on said shaft, said casing being formed with an air inlet at one end of said casing and an air outlet at the other end of said casing, said inlet and outlet being screw-threaded with similar threads and a screw-threaded coupling fitting into either opening, said coupling having a central passageway of smaller diameter than the inlet or outlet for receiving the air hose of a cleaning device.

2. A cleaner for interchangeable suction or blower operation comprising an elongated casing having end walls, a fan in said casing, a motor to drive said fan, an inlet opening in one end wall on one side of said fan, an outlet opening in the other end wall on the other side of said fan and means cooperating with either of said openings to alter the relative size of said openings for suction and blower operation respectively.

3. A device of the character set forth comprising, in combination, a casing, means with-

in said casing for producing flow of air there-through, said casing being formed with an air inlet and an air outlet oppositely disposed with reference to the casing, said inlet and outlet being screw-threaded with similar threads, a screw-threaded coupling fitting into either opening, said coupling having a central passageway of smaller diameter than the inlet or outlet and said central passageway being of smooth surface and tapering outwardly and means for passage of air comprising an air hose having an end tapered to jam into said central passageway.

4. A device of the character set forth adapted for both suction and blower action comprising a casing having an air inlet opening and an air outlet opening and removable means fitting into either opening, said means serving, on insertion into the inlet opening to provide a restricted inlet for suction operation and serving, on removal from the inlet opening and insertion into the outlet opening, to increase the air inlet opening and to provide a larger air inlet than air outlet.

5. A device of the character set forth adapted for both suction and blower action comprising a casing having an air inlet and an air outlet, means for producing a current of air through the casing, and means for providing a larger inlet opening than outlet opening during blower action and a larger outlet opening than inlet opening during suction action.

6. A device of the character set forth comprising a casing of generally cylindrical formation, means within said casing for producing flow of air therethrough, said casing being formed with an air inlet at one end thereof and an air outlet at the other end thereof, said inlet and outlet being screw-threaded with similar threads and a screw-threaded coupling fitting into either opening, said coupling being made of insulating material and having a central passageway of smaller diameter than the inlet or outlet for receiving the air hose of a cleaning device.

7. A device of the character set forth adapted for both suction and blower action comprising a casing having an air inlet opening and an air outlet opening and means cooperating with said air outlet opening to decrease the air outlet opening during blower action.

8. A cleaner comprising a casing of generally cylindrical formation, means within said casing for producing flow of air there-through, said casing being formed with an air inlet at one end of said casing and an air outlet at the other end of said casing, a coupling fitting into said outlet, said coupling having a central passageway of smaller diameter than the outlet, said central passageway being of smooth surface and tapering outwardly and means for passage of air comprising an air hose having an end tapered to jam into said central passageway, said

coupling serving, on removal from said outlet to increase the size of the outlet.

9. A cleaner comprising a casing, means within said casing for producing flow of air therethrough, said casing being formed with an air inlet and an air outlet, a coupling fitting into said outlet for connecting an air hose to said casing, said coupling having a central passageway of smaller diameter than the outlet and serving, on removal from said outlet, to increase the size of the outlet.

In testimony whereof we have hereunto affixed our signatures.

AXEL OLOF ENGBERG.
FREDRIK CARLSTEDT.