

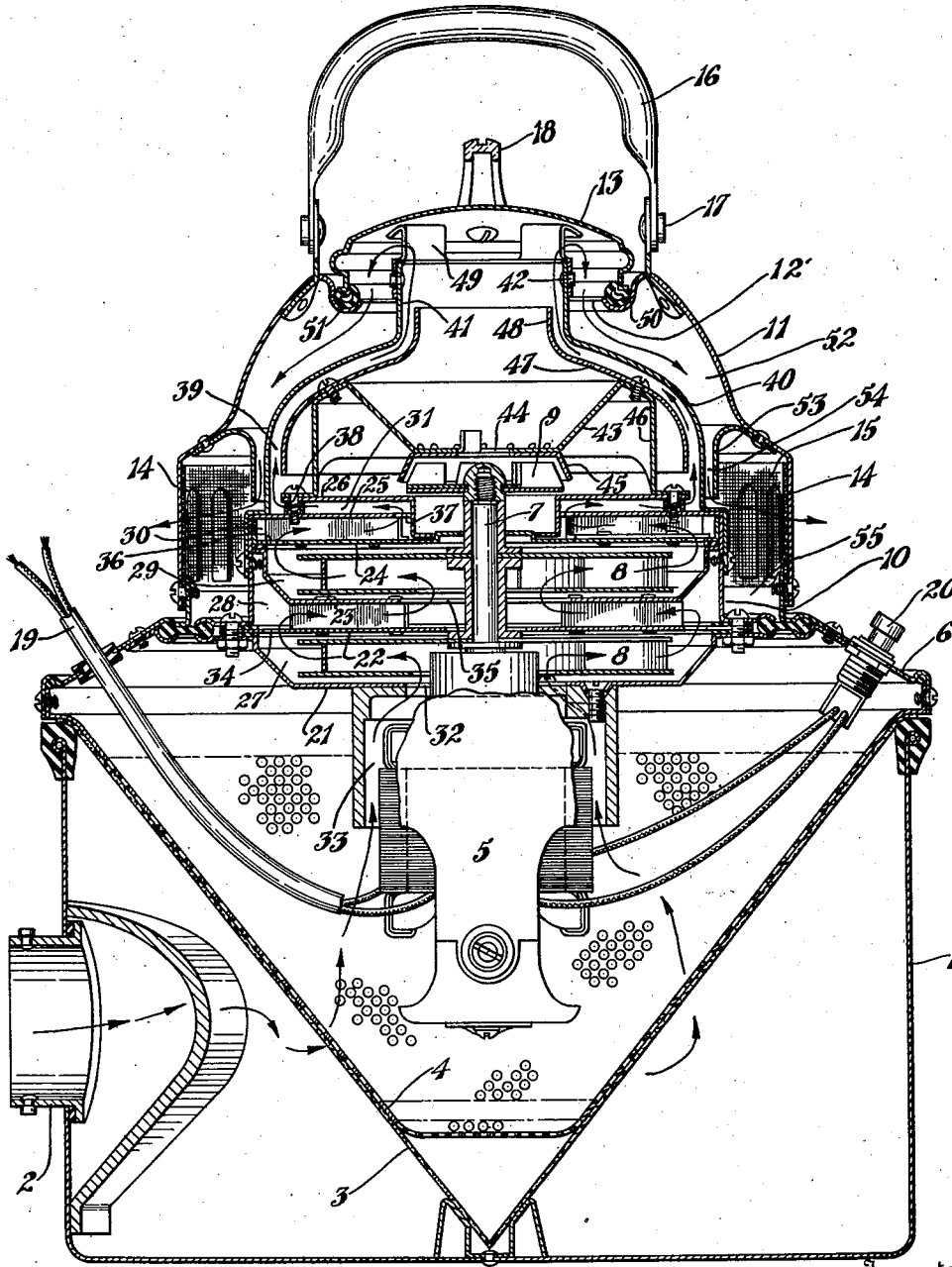
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SUCTION CLEANER AIR FLOW CONSTRUCTION

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SUCTION CLEANER AIR FLOW
CONSTRUCTION

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The invention relates to suction cleaners, and more particularly to an air flow or air passage construction for a suction cleaner preferably of a vertical type having a pan-like dust collector, a dust filter, a single or multiple stage fan driven by a motor, and air duct passage means leading to, through and from the fan.

It is desirable when possible in suction cleaner construction, to pass the air flowing through the cleaner over the motor for cooling the motor. This cooling effect is more efficient if the air passes over, around and through the motor before it passes through the fan, because the air is heated somewhat in passing through the fan and the relative cooling effect is somewhat less if the air passes through the fan prior to passing over, around and through the motor for cooling purposes.

Suction cleaner constructions have been provided for passing cool air first over the cleaner motor and then through the cleaner fan, but such prior constructions have prevented the presence of other desired features in the cleaners.

Vapors or particles of chemical crystals or other reagents are frequently used in and discharged from a suction cleaner for moth control or other purposes; and with the use of certain reagents it is frequently desired to utilize heated air for aiding in the vapor or particle discharge and dissemination, when the cleaner is being so operated.

Suction cleaners have been provided in which separate air or reagent heating means is incorporated; or in which reagent vapors or particles are introduced into an attached blower tube leading from the discharge end of the cleaner upon removal of the usual dust bag. However, such constructions have not been adapted for the passage of cooling air over the fan motor prior to the passage of said air through the fan.

It is frequently desired to operate a suction cleaner either as a cleaner, or as a blower. When the cleaner is operated in the usual manner as a cleaner, it is desired to avoid any concentrated air blast at the cleaner discharge; and when the cleaner is operated as a blower a concentrated air blast is of course desired.

Suction cleaners adapted for such operation have been provided, but such constructions require the removal of the usual dust bag for substituting a blower hose and tool. However, dust bag removal for blower operation should be avoided, to avoid the possibility of spilling, spreading or otherwise disseminating the dust and dirt which has been collected.

Other constructions have been provided which

may be blower operated, but which discharge a concentrated blast when normally operated as a cleaner. Still other constructions have been provided which avoid a concentrated blast when normally operated as a cleaner, but which cannot be blower operated. In any event, constructions adapted for blower operation, or for the avoidance of a concentrated blast when normally operated as a cleaner, or both, have not been adapted for the use of heated air for reagent vapor or particle discharge, and for air cooling the motor prior to passing the air through the cleaner fan.

It is desirable in the operation of a suction cleaner to reduce the noise emanating from the cleaner incident to the flow of air to a minimum; and this has been controlled in the past by turning the flow of air within the cleaner and by increasing or decreasing the areas of air flow passages at or intermediate turns therein.

However, air flow noise control by the provision of turns or changes in passage areas has neither been provided in a suction cleaner which may either be operated as a blower or without a concentrated exhaust blast during normal cleaner operation; nor in a suction cleaner in which heated air may be used for reagent vapor or particle discharge; nor in a suction cleaner in which the fan motor may be cooled by air passed through the motor prior to passing through the fan.

Finally, while a vertical type suction cleaner is desirable from many standpoints for certain types of work; no vertical type cleaner has heretofore been provided which incorporates a plurality or all of the desirable features enumerated hereinabove.

It is therefore an object of the present invention to provide an improved suction cleaner construction in which the air passing through the cleaner, first passes through and around the motor for efficiently cooling the motor before passing through the fan.

It is a further object of the present invention to provide a suction cleaner construction in which reagent or crystal vapors or particles may be discharged from the cleaner; and in which the air for such discharge may be heated for aiding in more efficient vapor or particle discharge and dissemination by the heat dissipated from the motor and developed in the fan.

It is also an object of the present invention to provide an improved suction cleaner construction which may be normally operated as a cleaner without any concentrated exhaust blast, or which

may be operated as a blower with a concentrated exhaust blast.

It is likewise an object of the present invention to provide a suction cleaner construction in which the air flow noise may be controlled and reduced by the provision of turns and area changes in the cleaner air ducts or passages leading to, through and from the fan by means of which the air flow is turned, expanded and contracted in and out and back and forth upon itself a number of times.

Each one of the preceding objectives is dependent upon the flow of air through a suction cleaner and it is therefore a further object of the present invention to provide an improved air flow construction for a suction cleaner.

Moreover, it is an object of the present invention to provide an improved suction cleaner construction of the vertical type in which a plurality or all of the foregoing objectives are incorporated.

And finally, it is an object of the present invention to incorporate the aforesaid desiderata in suction cleaner construction in a simple, inexpensive, convenient and readily operated manner, and to reduce the cost and simplify in general the construction of a suction cleaner.

These and other objects may be attained by the improvements, elements, combinations, arrangements and constructions comprising the present invention, a preferred embodiment of which is illustrated in the accompanying drawing, and is hereinafter described and claimed.

The invention may be stated in general terms as preferably including in suction cleaner construction, walls forming a dust receptacle, means forming an inlet opening through one of said walls, a dust filter in said dust receptacle, a motor, a single or multiple stage fan, fan passages, passages or ducts leading from the dust collector around and through the motor to the fan passages, exhaust passage or duct means leading from the fan passages to distributed large area normal cleaner outlet opening means, blower connection means with said exhaust duct means intermediate the fan passages and outlet opening means, reagent distributor and container support means communicating with the exhaust duct means for passing air flowing through the exhaust duct means through and around a reagent container supported thereby; and there being a plurality of turns and area changes in said ducts and passages.

In the drawing, the figure is an enlarged vertical section through a vertical type suction cleaner illustrating the improved air flow construction.

Similar numerals refer to similar parts in the drawing.

The suction cleaning apparatus shown in the drawing is a vertical type suction cleaner and includes a pan-like base or receptacle 1, having an inlet opening connector 2, with which a flexible hose (not shown) may be connected in any suitable or usual manner. The hose may be provided with a suitable nozzle or other tool for cleaning any desired surface or article in the usual manner.

Preferably a conical paper or fabric dust filter 3 is supported against collapse on the truncated, foraminous, conical support 4, within receptacle 1, for separating dust and dirt from the dust and dirt laden air drawn into the cleaner and depositing the dust and dirt in receptacle 1. In the drawing, the openings in foraminous conical sup-

port 4 are only shown in section and diagrammatically in elevation, the preferred limits of the same being indicated in dot-dash lines.

The motor 5 is mounted on cover member 6, which cover member 6 is supported by and clamped to receptacle 1 by any suitable means (not shown). The motor 5 preferably extends downwardly from the cover member 6 within the recess of truncated conical member 4, as shown; and motor shaft 7 has mounted thereon centrifugal fans 8. At the upper end of motor shaft 7 there may also be provided a bladed rotor 9 for a purpose to be later described. The two centrifugal fans 8, and the fan housing and deflector walls generally indicated at 10 form a two stage suction or exhaust device for inducing a flow of air into and discharging a blast of air out of the cleaner normally in the general path shown by the arrows in the drawing.

The cover member 6 also supports a dome-shaped deflector housing shell generally indicated at 11, which encloses the fan housing 10 and is provided with an upper central outlet opening 12 normally closed by a removable closure member 13, as shown. The deflector shell 11 also has formed therein preferably a series of circumferentially located and spaced outlet openings 14 of large combined area, which may be internally covered by a fine mesh wire screen 15 as shown.

A carrying handle 16 may be pivotally mounted at 17 on deflector shell 11, and handle 18 may also be mounted on closure 13 in any suitable manner. An electrical conductor 19 may be connected with any suitable source of power and extends through cover member 6 to motor 5. A preferably foot operated or push button control switch 20 for the cleaner motor 5 may also be mounted on cover member 6.

Referring to fan housing and deflector walls generally indicated at 10, the same may, and preferably do, include partition members 21, 22, 23, 24, 25 and 26 forming a plurality of compartments 27, 28, 29, 30 and 31. Opening 32 in partition member 21 communicates between compartment 27 and interior 33 of motor 5; openings 34 in partition 22 communicate between compartments 27 and 28; opening 35 in partition 23 communicates between compartments 28 and 29; openings 36 in partition 24, communicate between compartments 29 and 30; opening 37 in partition 25 communicates between compartments 30 and 31; and the outer circumferential edge of partition 26 in being spaced above partition 25 by spacer means 38 provides peripheral outlet opening or passage means from compartment 31 into passage means 39.

Fan housing 10 may also support a generally tubular inverted funnel-shaped wall 40 terminating in a restricted neck 41 having pins 42 projecting therefrom; and fan housing 10 also supports a trough member 43 having a central opening 44 and a shell member 45 extending downward around bladed rotor 9. The trough member 43 is supported by spider-like legs 46 on fan housing 10.

Trough member 43 in turn has mounted thereon a generally tubular inverted funnel-shaped member 47 terminating in a restricted neck 48 so that the walls of members 40 and 47 form the passage 39 previously described.

The pins 42 provide for the telescopic bayonet joint attachment of member 49 provided on the inside of closure member 13 whereby closure member 13 may be removably seated in air-tight

relation with gasket 50 carried in annular socket 51 surrounding opening 12.

A passage or compartment 52 is also formed between dome-shaped deflector shell 11 and funnel-shaped wall 40 and a circular inward and downturned skirt 53 is preferably mounted on member 11 to form passage 54 communicating between compartment 52 and compartment 55 located between fan housing 10 and that portion of member 11 provided with the outlet openings 14.

In using the improved suction cleaning apparatus, operation of switch 20 starts motor 5 and fans 8 to induce a flow of air inward through inlet opening means 2 and through any hose and tool connected therewith so that when the tool is drawn across a surface to be cleaned, dust and dirt is picked up in the usual manner.

The dust and dirt laden air enters receptacle 1 where the dust and dirt is deposited and separated from the air by filter means 3 and the air then flows over and around motor 5 and through the passages thereof as indicated by the arrows. The air at this time is cool and therefore most efficiently cools the motor, resulting in a heating of the air.

The air then flows through opening 32 into compartment 27 where first fan 8 discharges it out through openings 34 through compartment 28 and opening 35 into compartment 29 where second fan 8 discharges the air through openings 36 into compartment 30, thence through opening 37 into compartment 31 and then out through passage 39, through neck 41 after which the air flow doubles back upon itself by the deflection of cover 13 and deflector shell 11 through compartment 52, passage 54, compartment 55 and then out through outlet openings 14.

Thus, the flow of air through the cleaner fan chamber means from its entry to the first fan chamber through openings 32 is radially back and forth to and away from the axis of rotation of the fan; and the flow after leaving the fan chamber means is upward, inward, upward, downward, outward, downward and outward of the axis of rotation of the fan. The air flow is turned once just before entering passage 39, a second and third time within passage 39, a fourth time as it doubles back upon itself under cover 13 and a fifth time as it leaves passage 54 to enter compartment 55. This enumeration of turns of the air flow disregards the turning also occurring on entering and leaving compartment 52 and the double back turning through opening 37 in leaving compartment 30 to enter compartment 31.

Moreover, all of these turns in the air flow are accompanied either at the turns or preceding or following the turns by an increase or decrease in the total passage area, all of which controls and quiets noises incident to air flow in the normal operation of the cleaner.

The normal outlet openings 14 due to their large area and the very large combined area thereof located at the largest diameter of any of the air passages or compartments, discharge the air from the cleaner at low velocities radially in all directions so that a concentrated discharge blast is avoided.

However, the cleaner may be quickly and easily operated as a blower by detaching cover member 13 and attaching a blower attachment such as shown and fully described in my copending application Serial No. 273,636, to neck 41 adjacent the place of minimum passage area and where the air flow is a concentrated blast within the neck.

Moreover, members 43, 46, 47 and 48, which combine to form passage 39, also may be used upon removal of the cover 13 as a supporting means for a container for crystal or other reagents, such as shown and fully described in my copending application Serial No. 273,636, said container being adapted to discharge said crystals or other reagents into the air blast, which crystals or other reagents may be fed through opening 44 and discharged by bladed rotor 9 into the flow of air entering passage 39. When reagents of one kind or another are thus discharged into the air stream, the heated air, initially heated by cooling the motor 5 and further heated in the fan chambers may be advantageously used.

And finally, as shown in the drawing, the above arrangements are compactly provided in a vertical suction cleaner construction.

The dust filter and motor and fan mounting construction shown and briefly described but not claimed herein is claimed in my copending application Serial No. 273,637, filed May 15, 1939; the fan construction shown and described, but not claimed herein, is the subject matter of a patent application of Elmer J. Kasper, Serial No. 261,476, filed March 13, 1939; and the crystal or other reagent attachment and supporting and mounting means therefor shown or referred to but not claimed herein, are claimed in my copending application, Serial No. 273,636, filed May 15, 1939.

Accordingly, the present invention provides for the efficient cooling of a suction cleaner motor; provides for the use of heated air when desired in the discharge of crystal or reagent vapors or particles; provides a construction which may be normally operated as a cleaner without any concentrated exhaust blast, or which may be operated as a blower with a concentrated exhaust blast; provides for the control of air flow noise; generally provides an improved air flow construction for suction cleaners; and provides improvements in the construction of a vertical type cleaner; all in a simple, inexpensive, convenient and readily operated manner.

I claim:

1. Suction cleaner construction adapted selectively for use as a cleaner without a concentrated air exhaust blast and as a blower with a concentrated air exhaust blast, including a motor, a fan, a housing shell enclosing the motor and fan, walls forming fan chamber means within the housing shell and having an axial restricted outlet neck, walls forming exhaust passages leading from said fan chamber means to said restricted outlet neck, removable closure means for the housing normally covering said outlet neck, walls forming exhaust passages communicating with said outlet neck within said housing and terminating in circumferentially arranged openings in said housing of greatly increased combined area with respect to said restricted outlet neck.

2. Suction cleaner construction adapted selectively for use as a cleaner without a concentrated air exhaust blast and as a blower with a concentrated air exhaust blast, including a motor, a fan, a housing shell enclosing the motor and fan, walls forming fan chamber means within the housing shell and having an axial restricted outlet neck, walls forming exhaust passages of varying area leading from said fan chamber means to said restricted outlet neck, removable closure means for the housing normally covering said outlet neck, walls forming exhaust passages of varying area communicating with

said outlet neck within said housing and terminating in circumferentially arranged openings in said housing of greatly increased combined area with respect to said restricted outlet neck.

3. Suction cleaner construction adapted selectively for use as a cleaner without a concentrated air exhaust blast and as a blower with a concentrated air exhaust blast, including a motor, a fan, a housing shell enclosing the motor and fan, walls forming fan chamber means within the housing shell and having an axial restricted outlet neck, walls forming exhaust passages leading from said fan chamber means to said restricted outlet neck, removable closure means for the housing normally covering said outlet neck, walls forming exhaust passages communicating with said outlet neck within said housing and terminating in circumferentially arranged openings in said housing of greatly increased combined area with respect to said restricted outlet neck, said exhaust passages extending inward and outward and backward and forward of the axis of said fan.

4. Suction cleaner construction adapted selectively for use as a cleaner without a concentrated air exhaust blast and as a blower with a concentrated air exhaust blast, including a motor, a fan, a housing shell enclosing the motor and fan, walls forming fan chamber means within the housing shell and having an axial re-

stricted outlet neck, walls forming exhaust passages leading from said fan chamber means to said restricted outlet neck, removable closure means for the housing normally covering said outlet neck, walls forming exhaust passages communicating with said outlet neck within said housing and terminating in circumferentially arranged openings in said housing of greatly increased combined area with respect to said restricted outlet neck, said exhaust passages extending inward and outward and backward and forward of the axis of said fan and having a plurality of area reductions and enlargements.

5. In a vertical type suction cleaner adapted selectively for use as a cleaner without a concentrated air exhaust blast and as a blower with a concentrated air exhaust blast and having a housing shell enclosing a motor and fan, walls forming an axial restricted outlet neck within said housing shell, walls forming air exhaust passages leading from the fan to said restricted outlet neck, means providing a reagent container support within said restricted outlet neck, a trough under said support for receiving reagent from the container supported thereby, and means for discharging said reagent from said trough into said air exhaust passages leading to said restricted outlet neck.

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Disclaimer

2,280,495.—*Eugene F. Martinet*, Cleveland, Ohio. SUCTION CLEANER AIR FLOW CONSTRUCTION. Patent dated Apr. 21, 1942. Disclaimer filed May 12, 1949, by the assignee, *Health-Mor, Inc.*

Hereby enters this disclaimer to claims 1, 2, 3, and 4 in said specification.

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