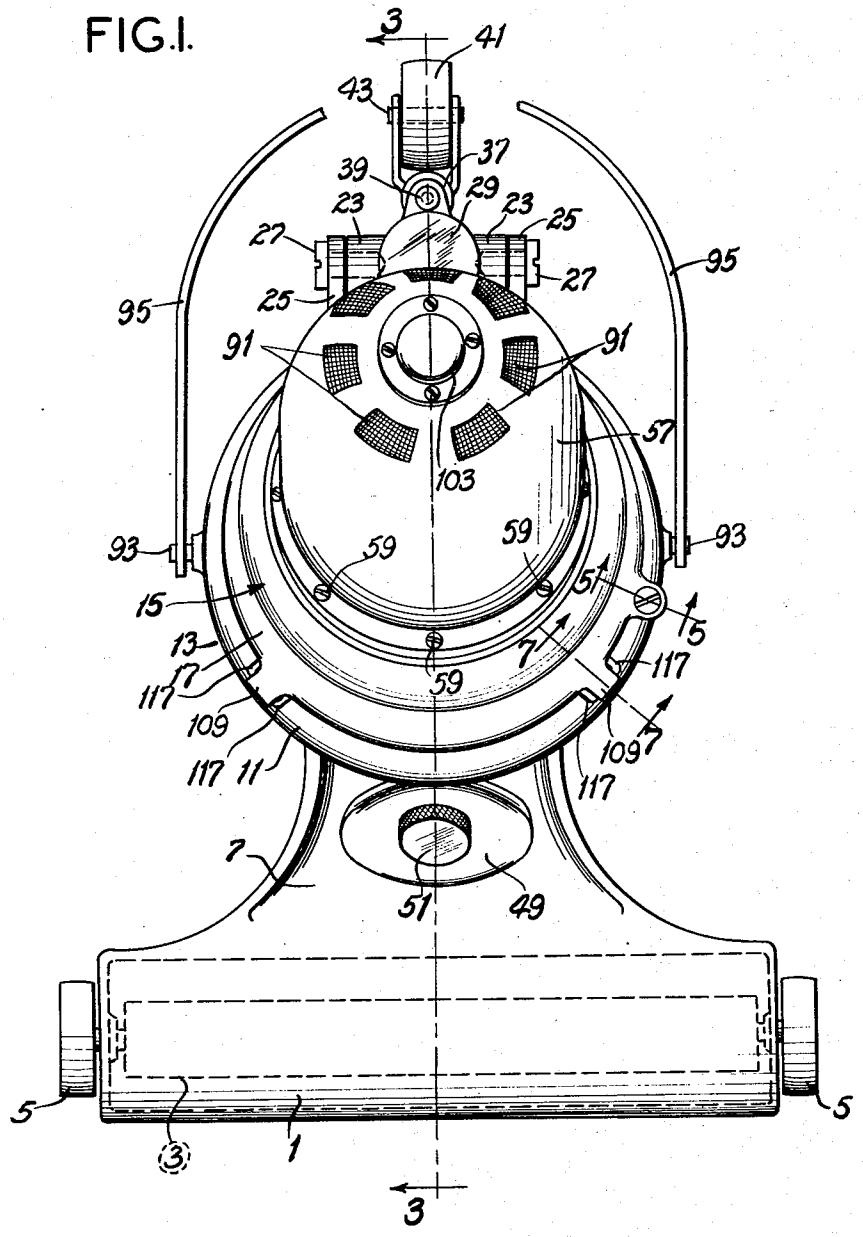
Oct. 20, 1936. 2,058,371

H. VAN ROSEN, NOW BY JUDICIAL CHANGE OF NAME H. VAN ROOSEN

CLEANER

Original Filed Dec. 21, 1931 5 Sheets-Sheet 1

FIG. 1.



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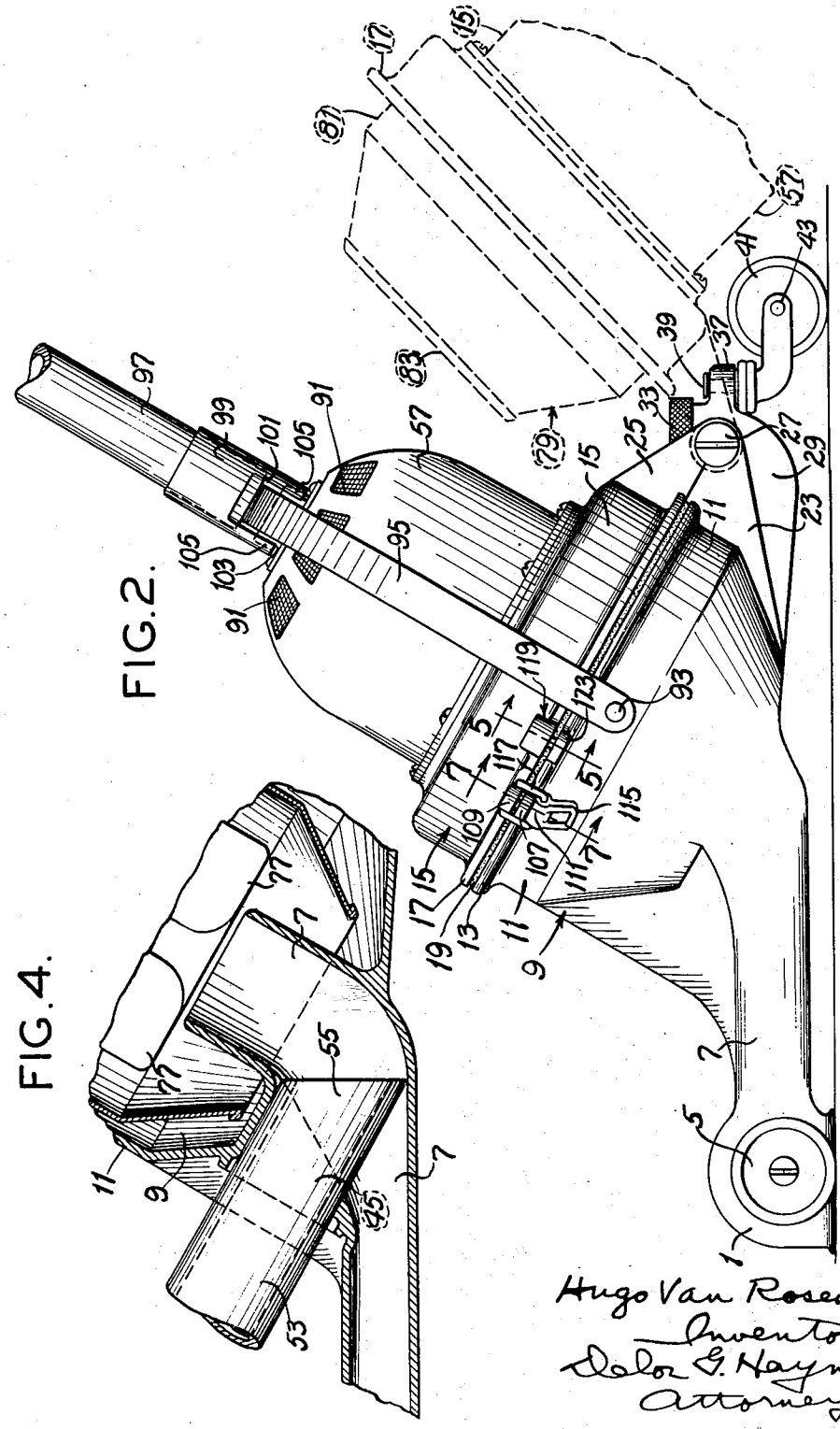


FIG. 2.

FIG. 4.

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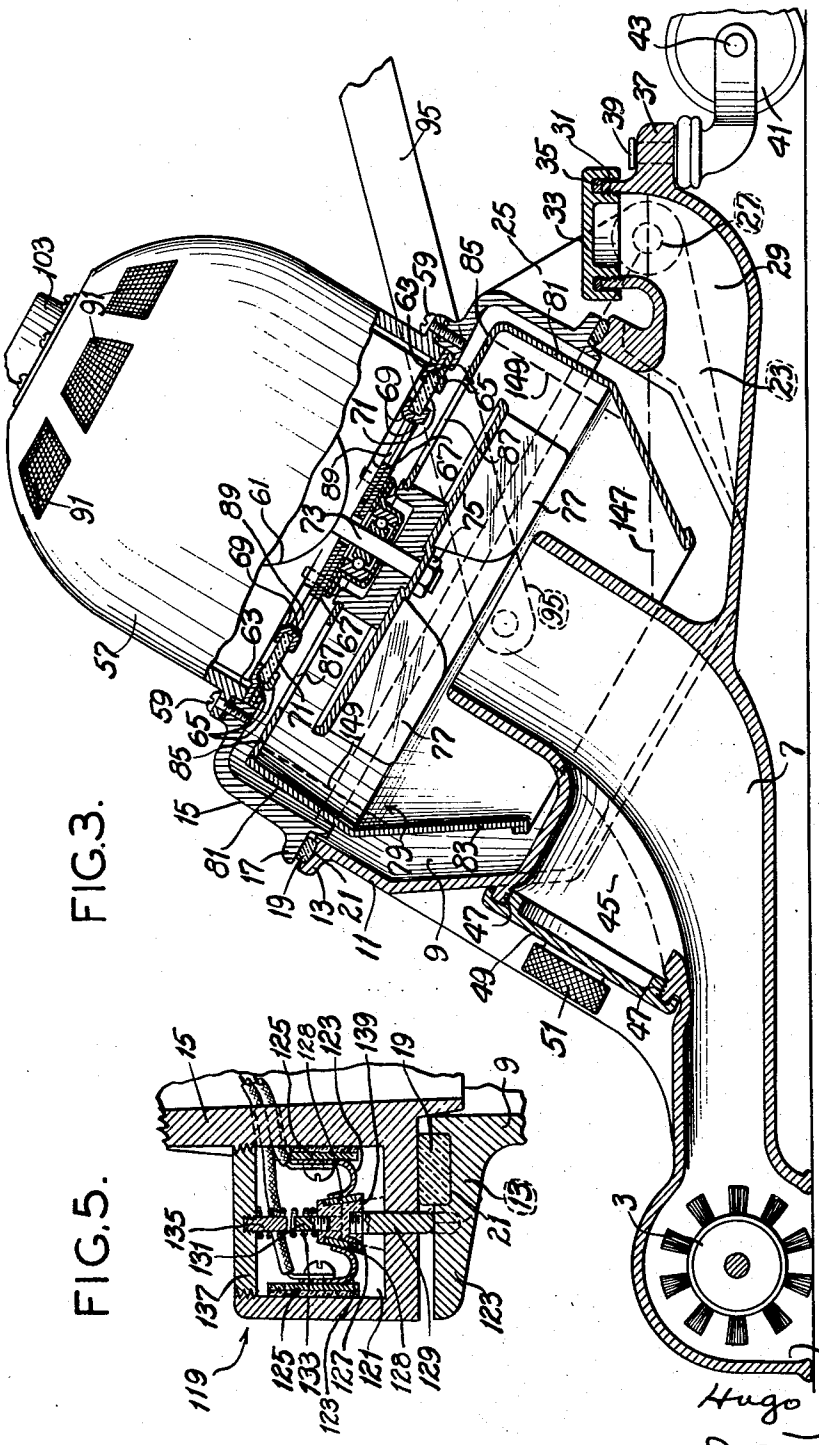


FIG. 3.

FIG. 5.

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FIG.9.

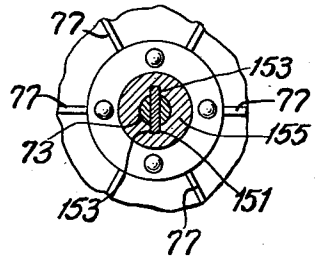


FIG.8.

FIG.10.

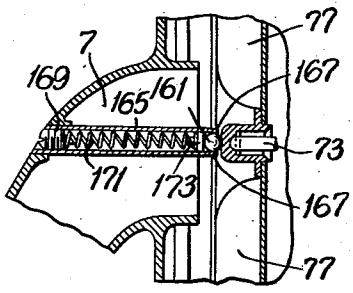


FIG.6

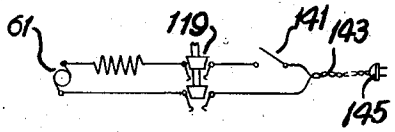
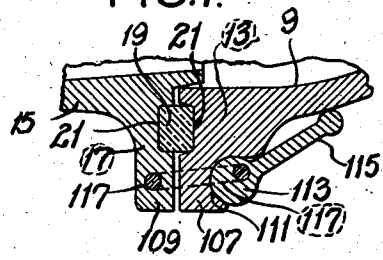


FIG.7.



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FIG.12.

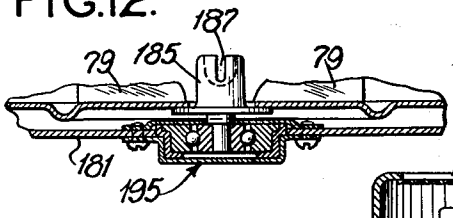
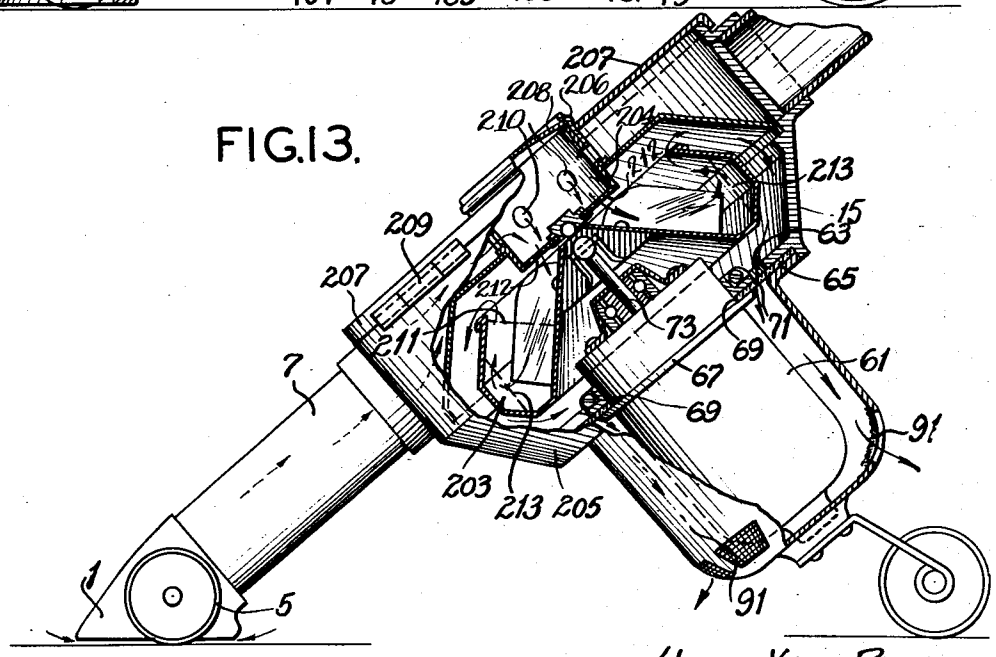


FIG.11.

FIG.13.



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UNITED STATES PATENT OFFICE

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CLEANER

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Application December 21, 1931, Serial No. 582,222
Renewed March 30, 1935 .

8 Claims. (Cl. 183—8)

This invention relates to cleaners, and with regard to certain more specific features, to cleaners such as vacuum cleaners for generating a current of dirt-laden air and removing the dirt from said air.

Among the several objects of the invention may be noted the provision of a cleaner of the class described which effectively cleans air by means of a film of dirt-absorbing liquid such as water or disinfectant, against which the current of dirt-laden air is impinged, a cleaner of the class described in which, under operating conditions, the film of water is positively positioned in most advantageous relationship for the impinging of the dirt-laden air thereupon; the provision of a cleaner of the class described which is constructed to prevent sloshing and loss of water or leakage, especially during operation; a cleaner of the class described which in addition to removing the dirt from a current of air, also humidifies said air before releasing it into the surroundings; a cleaner of the class described which is readily and quickly disassembled for cleaning and the like; and the provision of a cleaner of the class described which is relatively simple in construction and operation, and requires a minimum of special parts and the like. Other objects will be in part obvious and in part hereinafter described.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structures hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, in which are illustrated several of various possible embodiments of the invention,

Fig. 1 is a top plan view of a cleaner embodying the present invention;

Fig. 2 is a side elevation of the cleaner of Fig. 1;

Fig. 3 is an enlarged vertical section taken substantially along line 3—3 of Fig. 1;

Fig. 4 is a vertical section of a fragment of Fig. 3, showing the application of an adidtional element;

Fig. 5 is a section taken substantially along lines 5—5 of Figs. 1 and 2;

Fig. 6 is a diagrammatic representation of the electrical circuit associated with a cleaner embodying the invention;

Fig. 7 is a section taken substantially along line 7—7 of Fig. 2;

Fig. 8 is a vertical section of a second embodiment of the invention;

Fig. 9 is an axial section taken along line 9—9 of Fig. 8;

Fig. 10 is a fragmentary view of a portion of Fig. 8, showing an alternative holding means;

Fig. 11 is a vertical section of a third embodiment of the invention;

Fig. 12 is a fragmentary section illustrating an alternative form of mounting for the embodiment shown in Fig. 11; and,

Fig. 13 is a vertical section of a fourth embodiment of the invention.

Similar reference characters indicate corresponding parts throughout the several views of the drawings.

An inherent disadvantage of vacuum cleaners of the cloth bag type is that they do not completely remove the dirt from the generated current of air, but, on the contrary fill the air of the room being cleaned with a fine dust which is distinctly unsanitary and further occasions nasal irritations and the like. Regardless of the fineness of the fabric of which the bag is made, there is always a portion of the dirt which is finer in particle size, and which is inevitably released into the atmosphere. Another grave disadvantage of the air-bag type of vacuum cleaner is found in the difficulty and lack of sanitation brought about through cleaning of the cloth bag after it has become substantially filled with dirt.

Most of these disadvantages are overcome through the use of a vacuum cleaner working upon the principle of the precipitation of the dirt from the air by means of a body or film of liquid. Several air cleaners of this type have been presented heretofore, but they are uniformly disadvantageous, first, in that they require the carrying of a large body of liquid which has the effect of making the cleaner unduly heavy and difficult to move about, and second, in that most prior devices a construction is had which involves a number of tortuous passages through which the dirt-laden air is carried and in which it is impinged against a flow of liquid. Such tortuous passages and the like greatly increase the bulk of the cleaner, making it of an unwieldy size, and in addition increase the rate of consumption of water.

The present invention overcomes these difficulties, and provides a vacuum cleaner of the liquid type which is compact, small, and light in weight.

Referring now more particularly to Fig. 1, there is illustrated at numeral 1 the customary form

of nozzle, provided with a brush 3 and rollers 5. The brush 3 is rotated when in operation by the rolling of the rollers 5 upon the surface to be cleaned. The nozzle 1 has a throat portion 7, which delivers into a lower casing 9 (see Fig. 2). The lower casing 9 is frusto-conical in general appearance, and is surmounted by a cylindrical portion 11. An annular, outwardly-extending flange 13 upwardly terminates the lower casing 9. Surrounding the lower casing 9 is an upper cylindrical casing 15, of approximately the same diameter as the cylindrical portion 11 of the casing 9. The casing 15 has a lower annular flange 17 which is adapted to engage with the flange 13. Between the flanges 13 and 17 a rubber gasket 19 (see also Fig. 3) is provided. The rubber gasket 19 is desirably maintained in a suitable channel 21 in the flange 13.

Extending rearwardly from the casings 9 and 15 are projecting members 23 and 25, respectively. These projecting members each have means for receiving a pair of hinging studs 27. By means of the studs 27 the upper casing 15 may be rotated away from engagement with the lower casing 9, as illustrated in dotted lines in Fig. 2.

Between the projections 23 and the lower casing 9 is provided a spout 29. The spout 29 terminates upwardly in a threaded portion 31, which is adapted to threadedly receive a cap 33. A rubber gasket 35 normally seals the cap 33 to the spout 29. Projecting rearwardly from the spout 29 is a lug 37, which is bored to receive a bearing pin 39 of a castor 41. The castor 41 is free to rotate about its own axle 43 and also to rotate in a plane normal thereto about the pin 39. Thus it is permitted to trail in any direction when the cleaner as a whole is moved.

As will be seen in Fig. 3 the throat 7 of the nozzle 1 projects some distance into the lower casing 9. Prior to its termination in said casing, however, there is provided a sideward opening or tube 45, which is threaded at its outer extremity 47 to receive a cap 49 having a suitable knurled knob 51. The function of the tube 45 is illustrated more in particular in Fig. 4. In Fig. 4 it will be seen that the cap 49 has been removed and replaced by a telescoping tube 53. The tube 53 has an exterior diameter substantially equal to the interior diameter of the tube 45, so that when it is inserted therein a substantial seal is effected. The tube 53 has an angular end as illustrated at numeral 55. The end 55 is so arranged that it seals off the lower portion of the throat 7 from the upper portion thereof, and at the same time places the tube 53 in communication with said upper portion 7. The tube 53 may be used for connecting small appliances, such as drapery cleaners and the like, which are usually placed at the end of a flexible tube (not shown), during the use of which it is not ordinarily desired to use the nozzle 1.

Returning to Fig. 3, it will be seen that the upper casing 15 is surmounted by a motor housing 57. Studs 59 secure the housing 57 to the casing 15. Supported within the housing 57 is a motor 61 of suitable characteristics for achieving the work described hereinafter. The manner of supporting the motor 61 is particularly advantageous as will be indicated more fully hereinafter. It is substantially as follows: the top of the upper casing 15 includes an annular opening 63, the edge of which is grooved to form an inwardly spaced pair of clamping surfaces 65. The motor 61 is formed with a disc 67 which is outwardly grooved to present clamping surfaces 69 facing the clamping surfaces 65. Firmly secured in the clamping surfaces 65 and 69 is a flat rubber annulus 71. The rubber annulus is of suitable rigidity to support the weight of the motor 61, but is also flexible enough to absorb shocks and permit a slight rotation of the motor 61 under conditions to be described hereinafter.

The shaft 73 of the motor 61 extends through an opening in the disc 67 and into the enclosing means or chamber formed by juxtaposition of the upper and lower casings 15 and 9. It is preferably, although not necessarily, coaxial with the upper end of the throat 7.

Secured to the end of the shaft 73 as by a nut 75 in a non-rotatable manner is a pair of elements.

The first of these elements is a fan blade arrangement 77. The design and positioning of the fan blades is of little consequence so long as they function as hereinafter described. The arrangement is such that they create a suction through the nozzle 1 and throat 7, thereby forming a draft of dirt-laden air, and then direct said air radially outwardly from the region of the fan blades.

The second element affixed to the shaft 73 in a non-rotatable manner comprises a bowl 79. It is the bowl 79 with which the present invention is particularly concerned. The bowl 79 has an upper, substantially cylindrical portion 81, and a lower open-ended frusto-conical portion 83. In general conformation it resembles the combination of the casings 9 and 15, although it is of such size that it can freely rotate without touching the inner walls of said casings 9 and 15. The upper end 85 of the cylindrical portion 81 is closed, except for a number of spaced holes or openings 87 therein.

The disc 67 has a number of spaced openings 89 for permitting the passage of air from the casing 15 into the motor housing 57. At the upper end of the motor housing 57 are provided a number of openings 91, which are preferably screened in order to prevent foreign objects from entering the motor housing, for delivery of the air received through the openings 89.

Bosses 93 which project from the lower casing 9 at diametrically positioned points rotatably receive a forked handle 95, of a general conformation customary in the art. The forked handle 95 terminates upwardly in a single handle 97. Loosely mounted on the handle 97 is a ferrule 99 which has a pair of notches 101 cut therein whereby it is adapted to slip over and across the forked handle 95. Mounted on the top of the motor housing 57 is a boss 103. The depending legs 105 of the ferrule 99 as formed by the notches 101 are adapted to surround the boss 103 to hold the handle 97 in a given position when it is so desired. It will be seen that the position may be readily changed merely by lifting the ferrule 99, which is free to slide upon the handle 97, thus disengaging it from the boss 103.

The casings 9 and 15 are normally held together by a pair of overcentering clamps 107 (see Figs. 1 and 2). The clamps 107 are illustrated in more detail in Fig. 7. By reference to Fig. 7, it will be seen that for a short region the flanges 13 and 17 are extended outwardly to form projections 107 and 109 respectively. The projection 107 includes a seat 111 substantially semi-cylindrical in character. Numeral 113 indicates a substantially cylindrical camming member which is provided with a projecting handle 115. A closed wire linking 117 is rotatably mounted in

the projection 109 and in the cylinder 113, it being somewhat off-center in the cylinder 113. It will be seen that by lifting the handle 115 away from the casing 9, the link 117 is brought into such position that the cylinder 113 may be removed from the seat 111, whereby the casings 9 and 15 may be rotated away from each other. The off-center relationship of the link 117 in the cam 113 permits a pressure to be brought to fasten the casings 9 and 15 securely together when in operation.

It will be understood that the above form of clamp is shown by way of illustration only, and that the nature of the clamp is not essential to the present invention.

Referring again to Figs. 1 and 2, numeral 119 indicates a small electric switch that is formed on the casing 15 in the region of the flange 17. Fig. 5 illustrates an exemplary form of this switch, although it is to be understood that its precise construction is immaterial to the invention.

Referring to Fig. 5, it will be seen that there is formed as an extension of the flange 17, a cylindrical or like housing 121. Opposite the housing 121 is a projection 123 of substantially the same contour formed as an extension of the flange 13 on the lower casing 9. The casing 121 includes a pair of double spring contacts 123, suitably insulated as at 125, and adapted to connect and disconnect with an insulated plunger 127 having contacting bars 128 mounted thereon. The plunger 127 has a pin 129 which extends through the lower portion of the casing 121. The plunger is also provided with a pin 131 which receives a compression spring 133 normally held in position by means of a pin 135 mounted in a removable cap portion 137. The compression spring 133 is arranged so that it normally urges the plunger 127 to a position shown in dotted lines in Fig. 5, such that a shoulder 139 of said contactor seats against the lower surface of the housing 121. In this normal position the pin 129 extends a relatively great distance from the housing 121.

When the casings 9 and 15 are juxtaposed, now, the projection 123 on the lower casing 9 engages the projecting pin 129 and forces it backwardly against the compression spring 133 to force the plunger 127 back, thus forcing the contacting bars 128 into connecting position across the respective contacting springs 123. The operation of the switch is automatic and effectual upon opening and closing of the casings 9 and 15.

The electrical circuit of the cleaner as a whole is illustrated diagrammatically in Fig. 6. It will be seen that the motor 61 and the switch 119 are connected in series with a customary handle switch 141, and thence through a customary flexible cord 133 to a connecting plug 135. The switch 119 provides a safeguard whereby, when the casings 9 and 15 are opened from one another, it is impossible for the motor 61 to be energized. The advantage of this will appear more particularly hereinafter. Under normal conditions, operation of the cleaner is controlled by the handle switch 141, the switch 119 being in closed position.

The operation of the cleaner, assuming the elements to be initially in their Fig. 3 position, is as follows:

The cap 33 closing the end of spout 29 is removed, and a dirt-absorbing liquid such as water, or water to which a desirable quantity of disinfectant has been added, is introduced therein until a liquid level substantially that indicated by numeral 147 is reached. It is essential that the level 147 be above the lowermost point of the bowl 79. The cap 33 is then replaced. With the water level so established, the switch 141 is manipulated to set the motor 61 into operation. The bowl 79 and the fan 77 both being non-rotatably secured to the shaft 73 of the motor 61, are rapidly brought to a high rotation speed. Rotation of the bowl 79 sets up centrifugal forces which cause the liquid to be drawn up or pumped along the conical portion 83 of the bowl 79 and established in a cylindrical film around the inside of the cylindrical portion 81 of the bowl 79. The water is held in this position by means of the centrifugal force. The level of the water under rotating conditions is illustrated at numeral 149. The conical portion 83 of the bowl 79 continues to draw up or pump the water until the liquid level 147 has dropped below the lowermost portion of said conical portion 83. By this time a film of water has been established at the 149 position of appreciable depth. Meanwhile, the fan 77 creates a suction through the nozzle 1, and, when the device is moved in a manner customary with vacuum cleaners, the brush 3 and the suction in the nozzle 1 combine to draw dirt and the like from the surface being cleaned. The dirt-laden air passing through the throat 7 meets the rapidly rotating blades of the fan 77 and is changed in direction and impinged in a radial direction against the film of water 149. Again by reason of the centrifugal force, combined with the inertial forces of the dirt particles incident to the speed of the dirt-laden air, the dirt particles are thrown against the film of water 139 with considerable violence. By reason of the inherent absorbent characteristics of the water it retains the dirt particles thus impinged against it, while permitting the air, now free of such dust and dirt particles, to find its way out through the openings 87, 89, and 91 into the surrounding atmosphere.

As the cleaner is reciprocated over the floor in customary manner, a certain amount of sloshing of the water in the spout 29 and lower portion of the facing 9 is bound to take place. However, whenever this sloshing causes the liquid level 147 to rise above the lowermost point of the bowl 79, the water is immediately drawn up and positioned at its numeral 149 level. Thus, the natural sloshing of the water as the device is reciprocated is taken advantage of to increase the facility with which water is brought into its most active position.

The effectiveness of the cleaner as a whole is probably due to the fact that the water is positioned during operation in a plane normal to the direction, and completely surrounding the flow, of the high velocity, dirt-laden air. That is, the dirt-laden gases are impinged, at a high velocity, in a direction normal to the film of water. This increases the completeness with which the dirt particles are removed from the dirt-laden air.

When it is desired to stop operation of the device, the switch 141 is opened, thereby stopping the motor 61. As soon as the bowl 79 and fan 77 stop rotating, there no longer being any centrifugal force to hold the water at its numeral 149 level, said water immediately runs back into the lower portion of the casing 9 and the spout 29. By this time it may have become charged with a large amount of dirt and dust particles. In such event the cap 33 is again removed from the spout

29, and the device as a whole lifted up and the dirty water poured from the cleaner. It will be seen that this may be done in a very convenient and easy manner. The device may then be filled with fresh water and the cap 33 replaced for subsequent operation.

From time to time, a quantity of dirt accumulates on the walls of the bowl 79. Under such conditions, it is desirable to remove and clean the bowl 79 much as a dirty pan is cleaned. For this operation, the clamps 107 are freed, and the casing 15 rotated about the studs 27 to the dotted-line position shown in Fig. 2. The nut 75 is then removed from the motor shaft 73 and the bowl and fan assembly lifted therefrom. After the bowl 79 has been held under a running faucet or the like for a few seconds, all of the dirt will be found to have washed out and the device is ready for reassembly. During the time that the upper casing 15 is in its Fig. 2 dotted line position, the switch 119 is arranged in such manner that current cannot flow to the motor 61, and rotation thereof, which might be dangerous to fingers and the like, is thereby positively prevented.

From the foregoing it will be seen that the device operates under such conditions that sloshing or displacement of the liquid body is reduced to a minimum. What small amount of liquid remains in the spout 29 is ineffectual to accomplish any harm, because of the fact that the liquid is effectually sealed within the cleaner. The sealing is accomplished by the gaskets 19 and 35. Thus there is no danger of dirty liquid or the like spilling from the container on rugs or other surfaces being cleaned.

While the embodiment thus far described is considered to be the most practical, it is not necessary in all instances that the device be adapted to charge and discharge itself when the motor is started and stopped. With the above in mind, the embodiments illustrated in Figs. 8 to 16 have been designed. Referring more particularly to Fig. 8, it will be seen that the axis of the motor 61 is now horizontal, instead of oblique as in the Fig. 1 embodiment. Thus, the fan 77 and bowl 79 rotate on a horizontal axis instead of on an oblique axis. The bowl 79 is similar in construction to the bowl of the Fig. 1 embodiment. The bowl 79 and fan 77 are again assembled as a unit to be mounted on the motor shaft 73. Relative nonrotatability of the bowl fan assembly on the shaft 73 is secured by means of a pin or key 151 (see also Fig. 9), which is secured in the end of the shaft 73, and which fits into a key way 153 formed in a bushing 155 which is secured to the fan-bowl assembly. A resilient foraminous element 157 is secured across the outlet of the throat 7 of the nozzle 1. Centrally located in the foraminous element 157 is a ball retainer 159, which holds a ball 161 (of the general nature of a ball bearing). The ball 161, when the device is in operating position, engages a flat nose 163 on the bushing 155, and thus prevents the fan-bowl assembly from being removed from the motor shaft 73.

In Fig. 10 is illustrated an alternative method of securing the fan-bowl assembly against removal from the motor shaft 73. In this instance, the foraminous element 157 is not used, and in place thereof a tube 165 is mounted in the throat 7 in such a manner as to form a continuation of the axis of the motor shaft 73. One end of the tube 165 is bent in as at numeral 167 to form a ball retainer for the ball 161. The other end of the tube 165 is threaded to receive a tension adjusting plug 169. A compression spring 171, with a follower 173 at its ball-engaging end, provides the resilient pressure substituting for that of the foraminous element 157 in Fig. 8.

It is to be understood that the casing for the fan-bowl is divided into front section 9 and back section 15 similar to the related sections in the Fig. 1 embodiment. Further, suitable hinging and clamping means are also provided.

The operation of the embodiment illustrated in Fig. 8 is as follows:

By lifting the casing section 9 from the casing section 15 access is gained to the fan bowl. Water or other suitable dirt-absorbing liquid is now introduced therein. The water assumes a liquid level such as that indicated at numeral 175. It will be seen that the body of water is in the shape of a chord of the circle constituting the outer circumference of the bowl. The casing 9 is now closed upon the casing 15 and secured in position thereon. When the fan motor is now started, centrifugal action distributes the body of water about the entire inner circumference of the fan bowl in a substantially cylindrical film, and the liquid level assumed is substantially that illustrated at numeral 177. Again it will be seen that a film of water is provided against which the dirt-laden air is impinged by the blades of the fan. The current of air, after it has been impinged against the film of water, leaves the front end of the fan-bowl, passes around the outer circumference thereof to the back and out around the motor to the vent or opening 91, whence it is discharged into the atmosphere.

When the water has become so dirty that it is desired to replace it, the motor is disconnected. The slowing down action of the motor is itself sufficient to prevent any abrupt stoppage of the fan-bowl, and disadvantageous ejection of the water therefrom is thereby eliminated. When the bowl finally comes to rest, the dirt and water will, if sufficiently liquid, collect in the bottom portion and again resume a liquid level such as that shown at 175. Or, if the liquid has been so saturated with dirt as to have no longer the viscosity necessary to flow, the pasty mass remains adhering to the inner wall of the fan bowl. If the portion of the casing 9 is now removed from the portion 15, the fan-bowl may be removed from the motor shaft 73 and placed under a water faucet or the like. Then it is easily cleaned.

The function of the rubber motor mounting in this and the prior embodiment is to absorb the forces incident to the initial unsymmetrical positioning of the body of liquid considered with respect to the rotational axis. As symmetrical distribution is secured through the centrifugal forces set up, the rubber mounting permits the motor, and attached elements, to return to its normal axial position.

Fig. 11 illustrates a third embodiment of the invention operating somewhat according to the principles of the Fig. 8 embodiment. In this instance, the motor shaft is vertical, and the intake nozzle 1, by means of its throat 7, discharges downwardly into the fan-bowl. In this embodiment, the casing for the fan-bowl is again divided into an upper portion 179 and a lower portion 181, which are secured together by the customary clamp and the like. The fan and bowl are again assembled as a unit and mounted upon a central bushing 183 which has a socket 185 including keyways 187 in the upper end thereof. The socket 185 is arranged to receive a spherical

end 189, having a pin therein, mounted upon the lower end of the motor shaft 73. The under side of the bushing 183 includes a conical seat 191, which rests upon a conical bearing 193 centrally mounted in the lower casing 181. The conical bearing arrangement at numerals 191 and 193 may be replaced by a suitable roller thrust bearing 195 such as illustrated in Fig. 12. The balance of the fan-bowl upon the bearing 193 is enhanced, and the rotational inertia increased, by means of a ring 197 of heavy metal mounted on the underside of the bowl 79. This ring 197, it will easily be seen, operates upon the principle of a flywheel effect.

It is to be understood that the flywheel ring 197 may be added to any of the embodiments hereinbefore discussed, where the weight of the liquid and the like make it desirable.

The operation of the Fig. 11 embodiment is as follows:

The lower casing 181 is dropped from the upper casing 179 by opening the clamps provided. It will be seen that the fan-bowl 79 may then be readily removed and filled to a desired level, such as that indicated at 199, with the dirt-absorbing liquid. It will be seen that the initial capacity of this form of bowl is considerably in excess of both prior modifications described, inasmuch as it is maintained at all times in an upright position.

The fan-bowl 79 with its liquid level therein is now placed in position with the pin on the motor shaft 73 suitably positioned in the bushing socket 183. The bottom casing 181 is now brought into position with the bearing 193 in the bearing surface 191 and the clamps applied to maintain such position. When the motor is now started, the liquid is thrown by centrifugal action to the position illustrated by numeral 201. In this position the dirt-laden air is again impinged upon the film at right angles thereto. When it is desired to clean the fan-bowl, the motor stops, the lower casing 181 is removed, and the fan-bowl lifted out of the cleaner, flushed and replaced in the same manner as in the previous embodiment.

Fig. 13 illustrates still another embodiment in which the axis of the motor is again oblique as in the Fig. 1 embodiment, but in this instance, the free shaft end of the motor is in the upper, instead of the lower position. In this embodiment, the fan bowl is preferably given the conformation indicated at numeral 203, with the fan blades now arranged as the elements of a cone. The fan blades, however, are still arranged to direct the air at right angles to the centrifugal film of water. The casing for the fan-bowl and motor, illustrated at numeral 205, is in this instance made in a single piece with a lid 207 hinged as at 209 on the top front thereof. The lid 207 provides means whereby the fan-bowl 203 may be removed for cleaning. In this embodiment, the connection of the fan-bowl to the motor shaft 73 is similar to that in the Fig. 8 embodiment and does not require re-description. The lid 207 carries centrally a cylinder 204 which telescopes with a second cylinder 206. A cover 208 normally closes the outer end of the cylinder 204. Holes 210 in the cylinders 204 and 206 mesh to provide an inlet for the air coming through the passage seven. A screen 212 bottoms the cylinder 204.

In the operation of the present embodiment, the fan-bowl 203 is filled with water to the liquid level indicated at numeral 211. When the motor is started, the liquid arranges itself under the centrifugal force and forms the usual cylindrical film with its level as indicated at numeral 213. Thus the liquid is again positioned directly in the path of the dirt-laden air, as it comes from the nozzle 1 through passage 7 and holes 210 into the cylinder 204, and thence through the screen 212 to the fan, and effectively frees the air of its dirt. The cleaned air passes out around and behind the fan-bowl and around the motor to issue to the atmosphere through customary openings 91.

From the foregoing embodiments, it will be seen that the angle at which the motor shaft is positioned is of little consequence to the operability of the invention. The various embodiments have shown vertical, horizontal, and oblique axes in two directions. In each of these the fan and bowl are so arranged that under the centrifugal action a cylindrical film of water is presented directly normal to the path imparted to the dirt-laden air stream. Centrifugal action in all of these embodiments is sufficient to hold the liquid in such position regardless of the reciprocatory motion of the cleaner as it is moved on the carpet to be cleaned.

Throughout the specification, where reference has been made to the water or other dirt absorbing liquid, it is to be understood that a disinfectant may be added if it is so desired. Further, any liquid adapted for the reception and holding of dirt may be satisfactorily used. For example, certain oils of high viscosity and low vapor tension are quite successful in this particular use.

An advantage of the invention as heretofore described is found in the fact that the cleaned air released into the surrounding atmosphere, instead of being dry as in the bag form of vacuum cleaner, is suitably humidified by its contact with the water therein. This is itself a decided advantage, inasmuch as the atmosphere of the room being cleaned is not only left free of dust, but is also humidified to a desirable extent.

The safety switch illustrated in Fig. 5 and described in connection with the Fig. 1 embodiment is desirably used with all of the various embodiments of the invention, as it provides a safety factor whereby the fan-bowl and like cannot run under any circumstances when the casing is opened, thus to furnish an element which might be dangerous to fingers when the bowl is changed or flushed or the like.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a vacuum cleaner, enclosing means comprising a pair of casings adapted to fit together, means within said casings for creating a draft of dirt-laden air comprising a fan and an electric motor for rotating said fan, means within said casings for removing the dirt from said dirt-laden air comprising a bowl coaxial with said fan and arranged to be rotated by said motor with said fan, said bowl being adapted to maintain, through centrifugal forces when rotating, a tubular film of dirt-absorbing liquid disposed to be in the direct path of said draft of dirt-laden air from said fan and an electric switch mounted on one of said

casings adapted to permit flow of electric current to said motor only when said casings are juxtaposed.

2. Means for removing dirt and the like from dirt-laden air comprising a casing containing a body of dirt-absorbing liquid; a bowl within said casing, said bowl comprising a cylindrical portion, the upper end of which is substantially closed, and a conical portion diminishing in diameter from the region of its jointure with said cylindrical portion, said conical and cylindrical portions being coaxial, their axis being oblique to the general plane of the device, and said conical portion being open at its small end, with at least a portion of said small end normally positioned below the liquid level of said body of dirt-absorbing liquid; a motor coaxial with said bowl and arranged to rotate the same, whereby said liquid, through centrifugal force, is pumped by said conical portion from said body of liquid to said cylindrical portion, and there maintained in a substantially cylindrical film; and a series of fan blades disposed radially with respect to the axis of said bowl, said blades, upon rotation with said bowl, creating a draft of dirt-laden air and directing it against the inner periphery of said cylindrical film of liquid.

3. In a vacuum cleaner, means for establishing and cleaning a draft of dirt-laden air comprising a bowl, said bowl being substantially cylindrical about its axis, said bowl terminating at one end with a closure, and at the other end with a liquid-retaining rim, a fan within said bowl, and a motor simultaneously rotating said fan and said bowl thereby actuating said fan to create a draft of dirt-laden air and direct said draft against the inner wall of said bowl, and thereby forming a cylindrical film of liquid introduced into said bowl in position to be impacted by said draft of dirt-laden air.

4. In a vacuum cleaner, means for establishing and cleaning a draft of dirt-laden air comprising a bowl, said bowl being substantially cylindrical about a substantially horizontal axis, said bowl terminating at one end with a closure, and at the other end with a liquid-retaining rim, a fan within said bowl, and a motor simultaneously rotating said fan and said bowl thereby actuating said fan to create a draft of dirt-laden air and direct said draft against the inner wall of said bowl, and thereby forming a cylindrical film of liquid introduced into said bowl in position to be impacted by said draft of dirt-laden air.

5. In a vacuum cleaner, means for establishing and cleaning a draft of dirt-laden air comprising a bowl, said bowl being substantially cylindrical about a substantially vertical axis, said bowl terminating at one end with a closure, and at the other end with a liquid-retaining rim, a fan within said bowl, and a motor simultaneously rotating said fan and said bowl thereby actuating said fan to create a draft of dirt-laden air and direct said draft against the inner wall of said bowl, and thereby forming a cylindrical film of liquid introduced into said bowl in position to be impacted by said draft of dirt-laden air.

6. In a vacuum cleaner, means for establishing and cleaning a draft of dirt-laden air comprising a bowl, said bowl being substantially cylindrical about an oblique axis, said bowl terminating at one end with a closure, and at the other end with a liquid-retaining rim, a fan within said bowl, and a motor simultaneously rotating said fan and said bowl thereby actuating said fan to create a draft of dirt-laden air and direct said draft against the inner wall of said bowl, and thereby forming a cylindrical film of liquid introduced into said bowl in position to be impacted by said draft of dirt-laden air.

7. A device as in claim 3, further characterized in that said bowl has a central bushing including a keyway, and said motor has a shaft including a key adapted to fit in said keyway, whereby said bowl and motor are quickly separable but are rotationally fixed relative to each other.

8. Means for removing dirt and the like from dirt-laden air comprising enclosing means comprising a pair of casings adapted to fit together, means within said casing for creating a draft of dirt-laden air comprising a fan and an electric motor for rotating said fan, means within said casing for removing the dirt from said dirt-laden air comprising a bowl coaxial with said fan and arranged to be rotated by said motor with said fan, said bowl being adapted to maintain, through centrifugal forces when rotating, a tubular film of dirt-absorbing liquid disposed to be in the direct path of said draft of dirt-laden air from said fan.

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