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WET OR DRY SHOP VACUUM CLEANER

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3 Sheets-Sheet 1

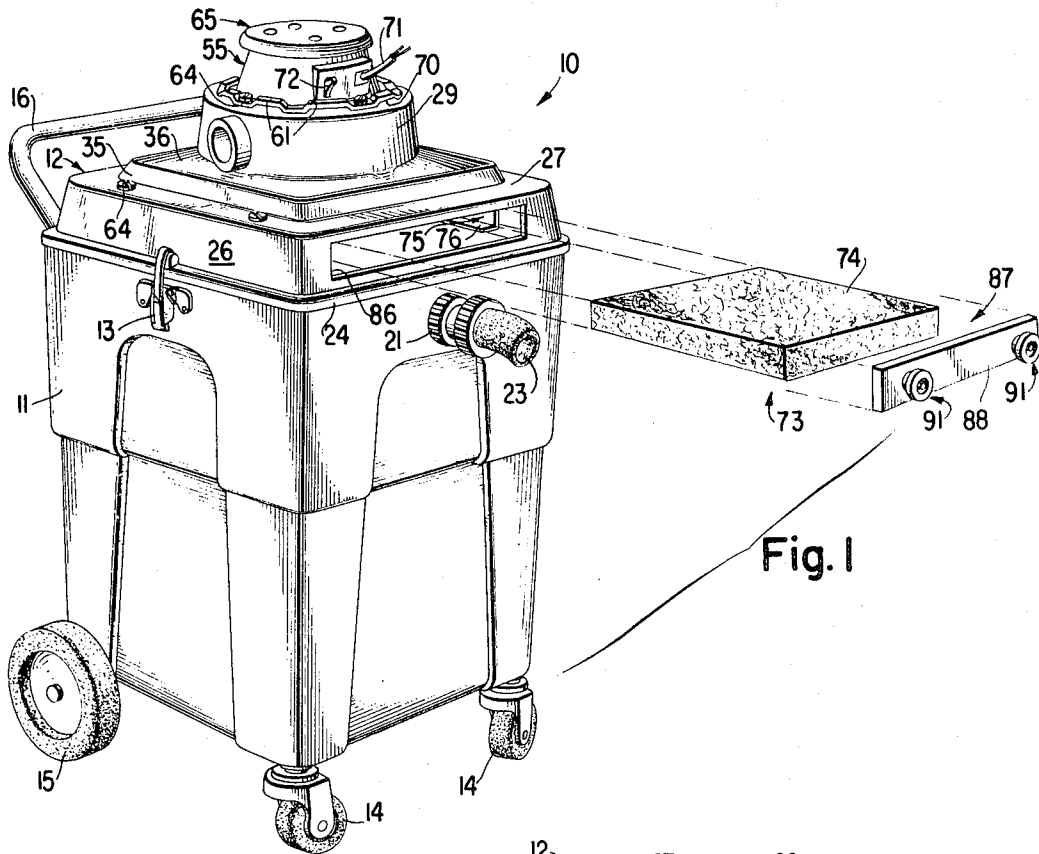


Fig. 1

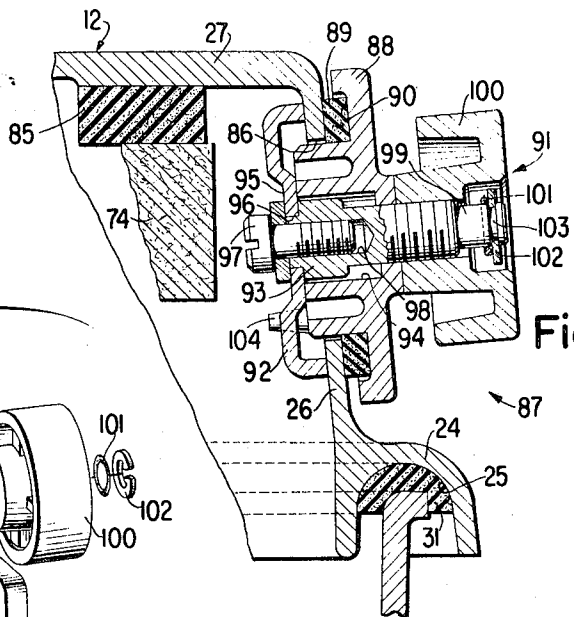


Fig. 3

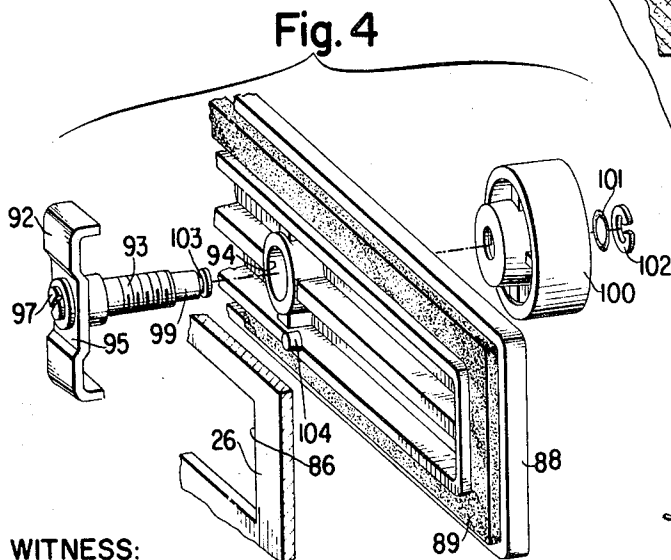


Fig. 4

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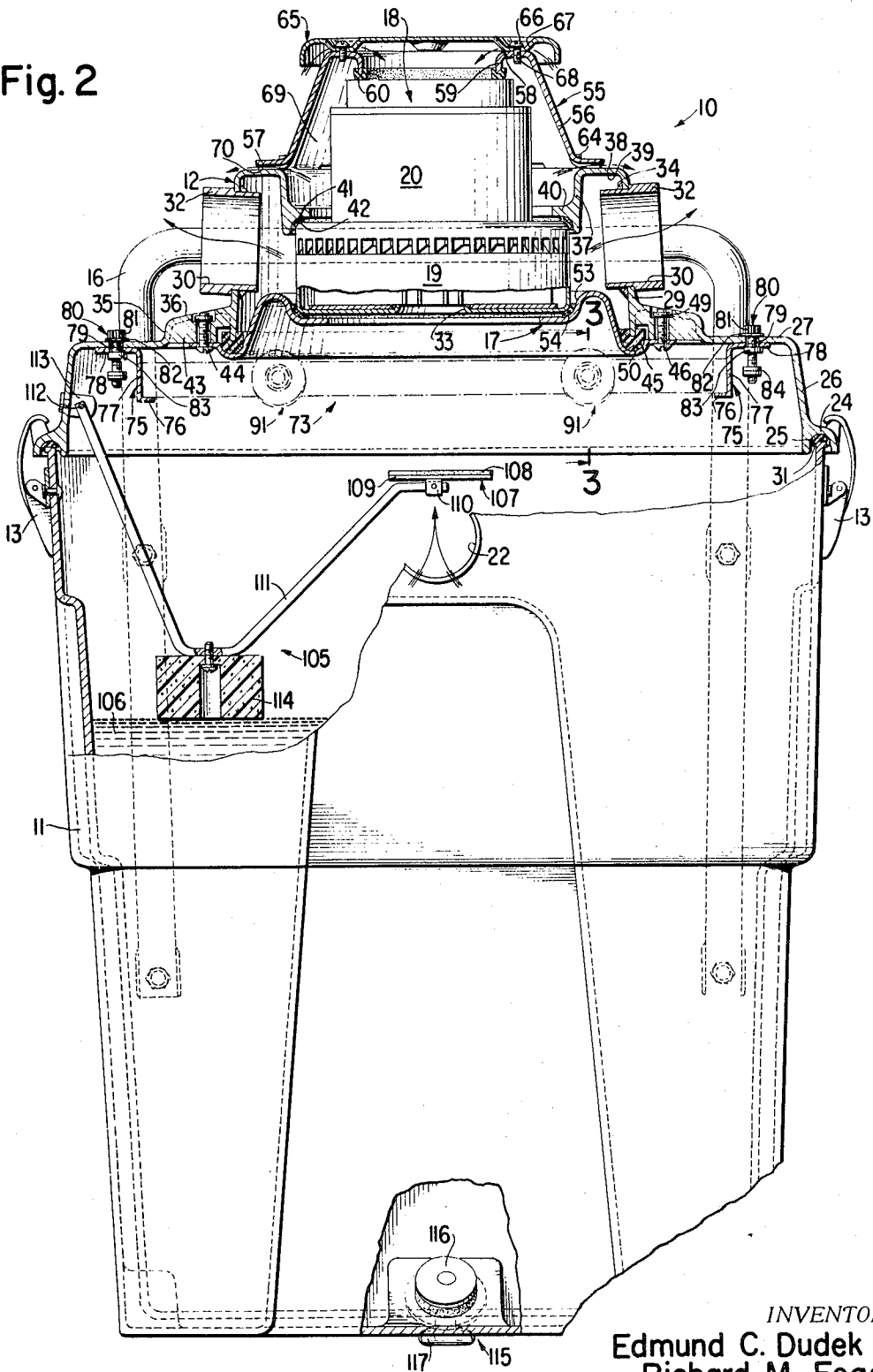
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Fig. 2



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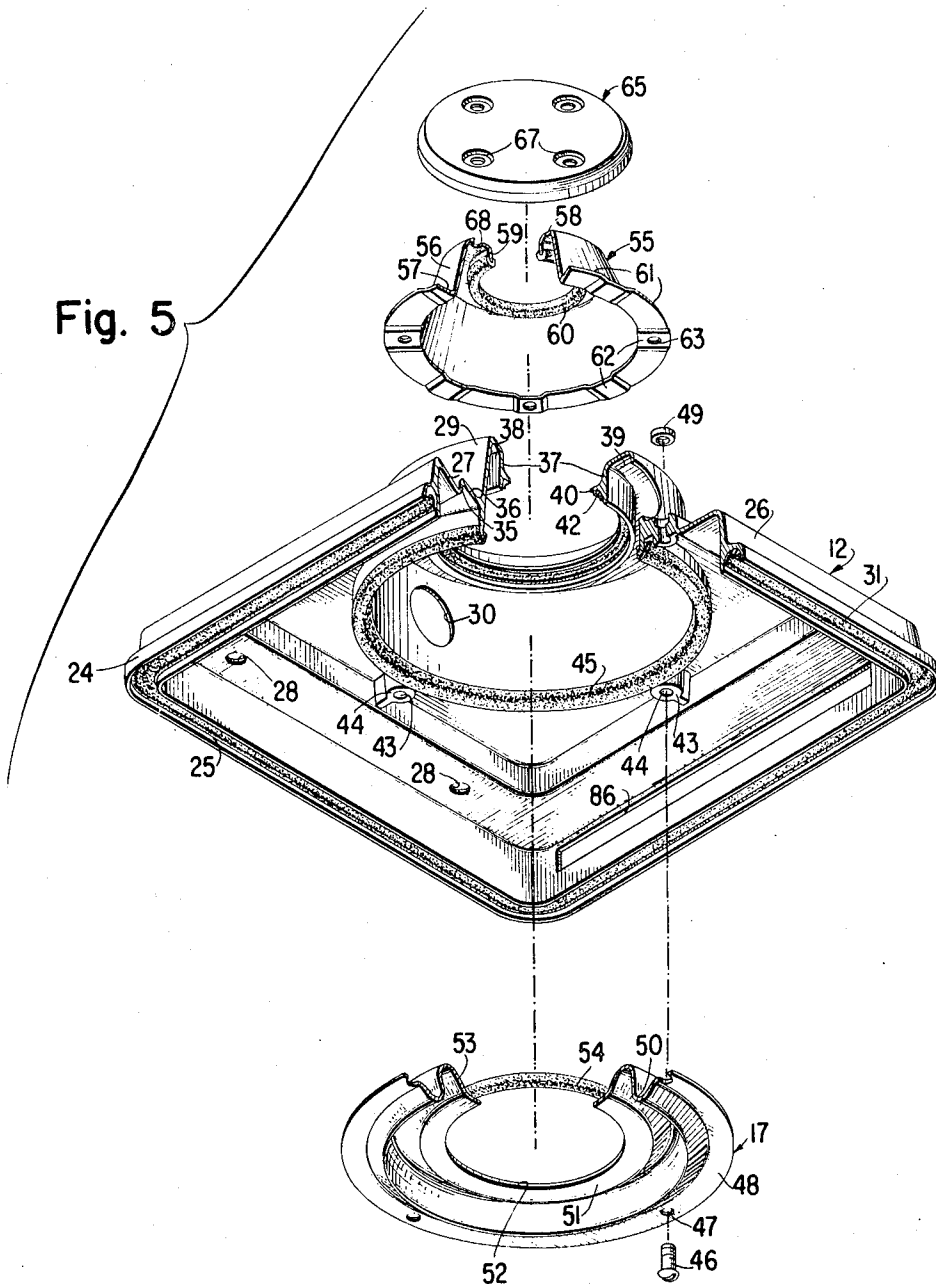
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WET OR DRY SHOP VACUUM CLEANER

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3 Sheets-Sheet 3

Fig. 5



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3,570,222

WET OR DRY SHOP VACUUM CLEANER

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9 Claims

ABSTRACT OF THE DISCLOSURE

The present vacuum cleaner, which is of the industrial type and is adapted either for wet or dry pick-up, comprises a container adapted to hold the liquid or dry material picked up by the cleaner and a cover which fits over the container and provides a housing for the motor-blower assembly and the filter assembly. A dump valve is provided for removal of the liquid from the container. The filter assembly includes a common furnace type filter that is suspended from an adjustable filter rail inside the cover and which easily can be removed through a frontal opening provided in the cover. A novel removable door closure arrangement and construction disposed over the frontal opening provides an airtight seal with the cover and facilitates removal of the filter when it becomes clogged or when it is necessary to remove the filter during operation of the cleaner for wet pick-up. The motor-blower unit resiliently is mounted on a support bracket constructed and arranged to facilitate assembly of the unit in the cleaner.

SUMMARY OF THE INVENTION

This invention relates to the art of vacuum cleaners and more particularly to a novel and improved vacuum cleaner of the industrial type, which is capable of picking up dirt or dust, as well as liquid matter, and which includes a novel and improved filter assembly and motor-blower mounting arrangement and construction that facilitates assembly of the cleaner as a whole.

Heretofore, vacuum cleaners of the industrial or shop variety have employed filter constructions and arrangements wherein the filter assembly has been of a relatively complex nature and the filter usually has been inaccessible from the exterior of the cleaner. Thus, in the prior art in order to unclog and clean a filter it has been necessary to disassemble the entire cleaner so that access may be had to the filter bag or the like. Further, in prior art cleaners of the present variety the assembly and disassembly of the cleaner is a primary consideration both from a product viewpoint in regard to repair and maintenance, and from an economic viewpoint in regard to the assembly of the cleaner at the factory. Also, in prior art industrial cleaners the motor blower usually is not readily accessible and takes a considerable amount of times and effort in assembling and disassembling it from the cleaner.

The present invention overcomes the above exemplary prior art deficiencies and more by providing a vacuum cleaner of the wet or dry pick-up type with a filter assembly including a furnace filter that is removably supported on an adjustable filter rail in the cover of the cleaner and which may be removed from the cleaner through a frontal opening provided in the cover of the

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vacuum cleaner. The opening normally is sealed airtight by means of a removable door closure arrangement disposed over the opening. The latter arrangement comprises a door member normally disposed in a locked position on the external surface of the cover. A pair of laterally spaced locking assemblies on the door cooperate with the adjoining cover to hold the door in place. When it is desired or it is necessary to remove the filter, the door may be readily removed by releasing the locking assemblies and removing the door whereupon access may be had to the filter. As to the method of assembling the motor-blower in the cover, the motor-blower first resiliently is mounted on a support bracket which in turn is fastened to the underside of the main cover wherein the blower is wedged between the support and an inward extending annular ledge of the main cover with the motor extending through a central opening formed in the support. A motor cover then is placed over the exposed motor and is secured to the main cover. With the motor-blower so assembled, the entire cover assembly then releasably is secured to the container. Thus, it is a relatively simple matter to obtain access to the motor-blower if desired for any reason.

Accordingly, it is a principal object of the present invention to provide a novel and improved filter assembly for use in a vacuum cleaner.

Another object of the present invention is to provide for a vacuum cleaner, a filter assembly that is simple in design yet dependable in operation and that includes a filter readily accessible to the operator from the exterior of the cleaner.

Another object of the present invention is to provide for a vacuum cleaner, a novel door closure arrangement that facilitates removal of the filter.

A further object of this invention is to provide a novel and improved motor-blower mounting arrangement and construction which facilitates assembly of the cleaner and makes the motor-blower readily accessible.

A still yet further object of the present invention is to provide a novel and improved vacuum cleaner capable of either wet or dry operation.

Having in mind the above and other objects that will be evident from an understanding of the disclosure, the invention is illustrated and described in the presently preferred embodiment thereof which is hereinafter set forth in such detail as to enable those skilled in the art readily to understand the function, operation, construction, and advantages of it when read in conjunction with the accompanying drawings in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates a perspective view of a vacuum cleaner of the industrial type with the filter and the filter door separated therefrom, embodying the present invention;

FIG. 2 illustrates a partial vertical sectional view of the vacuum cleaner shown in FIG. 1;

FIG. 3 is a sectional view taken substantially on the line 3—3 of FIG. 2 illustrating the filter door locking assembly;

FIG. 4 is a detached perspective view of the filter door and the door locking assembly; and

FIG. 5 illustrates a detached perspective view of the motor-blower mounting construction and arrangement.

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DESCRIPTION OF THE PREFERRED
EMBODIMENT

Referring more specifically to the drawings, wherein like reference numerals denote similar parts throughout the various views, the preferred embodiment of the present invention is illustrated as being incorporated in a vacuum cleaner of the commercial variety commonly used in workshops. The vacuum cleaner shown in FIG. 1, generally designated **10**, includes an open-topped fiberglass container **11** of substantially rectangular shape and an apertured main cover **12**, also made of fiberglass, normally positioned over the open end of the container **11** and removably fastened thereto by conventional means such as the draw pull catches **13—13**. The cleaner is portable and may be pushed about from one place to another by means of the wheels provided at the bottom of the container **12**. At the front corners of the container there are provided a pair of casters **14—14** of the standard type and at the rear corners of the cleaner there are provided a pair of standard rubber tired wheels **15—15** (only one being shown), the wheels and the casters being mounted to the container in a conventional manner. To facilitate movement of the cleaner from one place to another, there is provided a handle **16** secured at the rear of the container in a suitable manner as shown by the dotted line handle configuration in FIG. 2. Although it is not illustrated in the present drawings, the cleaner may accommodate racks for supporting the various accessories that may be used with the cleaner. These racks may comprise an upper and lower member preferably mounted at the rear of the container. The main cover **12** together with a mounting or support bracket **17**, which is made of metal, mounts the vacuum producing means comprising a bypass motor-blower **18** which includes a fan or blower section **19** and a motor section **20**. The bypass motor-blower includes a two-stage fan section and preferably is constructed and arranged so that the vacuum intake and the exhaust airstream is separate from the motor cooling airstream.

As best shown in FIG. 1, the front wall of the container **11** is provided with an intake ferrule **21** forming a vacuum intake opening **22** (see FIG. 2) which registers with the interior of the container and is adapted to receive a flexible hose **23**, partially shown in FIG. 1. The ferrule **21** is secured in position by suitable means such as a retaining ring or the like (not shown). The cover **12** surmounts the top edge of the container **11** by means of a peripheral flange **24** formed at the bottom of the cover **12** and having a curved undercut or groove **25** provided in the underside of the flange **24** for receiving and having secured thereto by suitable means a continuous rubber seal **31** (see FIGS. 2 and 5), which when secured on the container by the catches **13—13** forms an airtight seal therewith. A peripheral slightly sloping vertical wall **26** is spaced inwardly of the flange **24** and terminates above the flange in a continuous shelf **27** formed with a pair of spaced apertures designated **28—28** on opposite sides thereof. The cover **12** is formed with an outer annular wall **29** having a pair of diagonally disposed openings **30—30** formed therein to provide the vacuum exhaust. An exhaust ferrule **32** is secured to each of the openings **30—30** by conventional means such as a retaining ring **34**. A second wall **35** of similar slope to that of the vertical wall **26** extends upwardly from the inner end of the shelf **27** terminating in a continuous upper inner shelf **36**. The annular wall **29** extends upward from the inner shelf **36** and below the shelf **36** internally of the cover **12** for a comparatively substantially smaller distance terminating at substantially the level of the shelf **27**. A second inner annular wall **37** extending downward is spaced inward of the outer annular wall **29** and is integrally formed therewith through an apertured top shelf **38** thereby defining an inverted substantially U-shaped channel **39** between the walls **29** and **37**. The free end of the annular wall **37**

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is provided with a peripheral disposed flange **40** which together with an extended portion of the wall **37** forms a curved recess **41** for having secured thereto a motor-blower mounting rubber seal **42**. On the underside of the inner shelf **36** located between the annular wall **29** and the second vertical wall **35** are formed four equally spaced bosses **43** having through apertures **44** formed therein, respectively, with the aperture being counterbored from the outer surface of the inner shelf **36** as best shown in FIG. 2. At the free end of the outer annular wall **29**, there is secured an annular grooved rubber seal **45**. The motor-blower support bracket **17** is adapted to be secured to the underside of the cover **12** by conventional means comprising a threaded bolt **46** which passes through a corresponding aperture **47** formed in the annular peripherally disposed rim **48** of the bracket **17** and is received in a corresponding one of the bosses **43** whereupon a nut **49** is threaded onto the bolt, thereby to securely hold the support bracket **17** with the motor-blower mounted thereon in place within the cover **12**. With the support bracket **17** to disposed relative to the cover **12**, the annular channel or groove **50** formed in the bracket is located in abutting relationship with the seal **45**, that is, secured to the wall **29** thereby forming an airtight seal between the bracket and the wall **29**. The bracket **17** is provided with an inner annular edge surface **51** defining a central opening **52**. This surface **51** together with an adjacent slightly sloping upstanding wall **53** form a receiving surface for a motor-blower resilient mounting seal **54** and the fan section **19** of the motor-blower **18**, which seats between the resilient mounts **54** and **42**. The resiliency of the rubber rings **42** and **54** is such that it provides for quiet operation when the motor-blower is running. With the motor-blower mounted as described above, the inlet opening **33** of the blower or fan section **19** is aligned with the central opening **52** of the support bracket **17**. Thus, there is provided for the fan section **19** an airtight vacuum exhaust chamber having the necessary intake and exhaust openings **52**, **33**, and **30**, respectively, and comprising the seal **42**, the inner annular wall **37**, the top shelf **38**, the outer annular wall **29**, the seal **45**, and the motor support bracket **17**. The annular wall **37** defines a substantially cylindrical opening in the cover **12**, which opening receives the motor section **20** of the motor-blower **18**, as shown in FIGS. 2 and 5. Obviously, the motor section **20** requires cooling to prevent overheating and preferably the motor cooling airstream should be independent from the blower airstream. The motor section is enclosed by a polystyrene motor cover **55** comprising an annular truncated conical wall **56** having a ridged rim **57** integral therewith at its bottom end and terminating at its upper end in a horizontal annular shelf **58** and a downward extending inner annular wall **59** which carries at its free end a motor cover seal **60**. The rim **57** comprises a plurality of alternate surfaces **61** raised relative to a plurality of lower surfaces **62** alternately disposed between the surfaces **61**. Equally spaced and formed in the lower surfaces **62** are four threaded apertures **63**, which upon being aligned with corresponding threaded apertures (not shown) formed in the top shelf **38** of the main cover **12** receive a headed screw **64** whereupon the motor cover is securely fastened to the main cover **12**. A circular ventilator cover **65** made of polystyrene which protects the motor from rain or foreign matter is secured by means of the screws **66** which pass through the apertures formed in the countersunk recesses **67** in the cover **65** and thread into corresponding apertures **68** formed in the motor cover shelf **58**. The ventilator cover **65** is constructed such that when it is mounted to the motor cover **55**, an annularly disposed inlet opening for the motor cooling air, as shown by the arrows in FIG. 2, is provided between the two covers. The seal **60** abuts the top of the motor **20** so that the cooling air drawn in between the ventilator cover and the motor cover (as shown by the arrows in FIG. 2) passes through the motor per se and exhausts through

openings (not shown) provided in a motor-blower separator plate (not shown) into a substantially sealed chamber 69 surrounding the motor 20 and out into the surrounding atmosphere through the motor cooling air outlets 70 defined between the raised surfaces 61 and the top shelf 38 of the main cover 12. The seal 42, the inner annular wall 37, the wall 56 of the motor cover, the shelf 58, the annular wall 59, and the seal 60 comprise the chamber 69 having the outlet openings 70 as discussed above. Also conveniently mounted on the motor cover 55 is a cord 71 for supplying electrical power from an available source to the motor and a switch 72 operably connected with the cord 71 in a conventional manner to control the on-off conditions of the motor and thus, the cleaner.

During dry pick-up operation of the cleaner, a filter is required to separate the dirt particles from the vacuum intake airstream prior to the latter reaching the blower inlet opening 33. To accomplish this end, there is provided a unique filter assembly generally designated 73 including an externally accessible removable furnace type, reusable filter 74, preferably having a galvanized steel frame construction and a wire mesh disposed on each side of the filter material. To obtain the desired filtering the material used preferably is a polyester fiber, but other material suitable for filtering the dirt particles also may be used. The filter 74 removably is supported on a pair of laterally spaced vertically adjustable angled filter rails 75 including a left rail and a right rail, as seen in FIG. 2. Specifically, the filter is supported at either side on a ledge 76 extending the length of the rails. Each rail comprises a vertical wall 77 connecting the ledge 76 to a rail mounting shelf 78 including a pair of apertures 79—79 (only one being shown for each rail) located at either end of the corresponding rail, which apertures are adapted to be aligned with the corresponding aperture 28 formed in the shelf 27 of the main cover 12. To provide for vertical adjustment of the filter rails 75—75 and thus, the filter 74 carried thereby, there is provided an adjustment mechanism generally designated 80 and comprising a locking screw 81 having a head extending externally of the main cover 12 and a threaded portion passing through the aperture 28 in the main cover and the corresponding aperture 79 of the respective filter rail. Between the locking screw head and the main cover surface, there is disposed a washer 82 and adjacent the filter rail mounting shelf a nut 83 threaded onto the screw 81, which cooperates therewith to facilitate the vertical disposition of the filter 74. At the free end of the screw 81, there is provided a stop or abutment member 84 to prevent disengagement of the screw from the nut 83 which would cause the filter 74 to be located improperly in the cleaner. Also disposed about the periphery of the filter is a continuous filter seal 85 (see FIG. 5) which functions to prevent leakage of the vacuum intake airstream once it passes through the filter. Thus, substantially the entire intake airflow is directed through the motor-blower inlet opening 33. Any dirt or other foreign matter contained in the intake airflow is filtered out by the filter 74 and drops to the bottom of the container. Naturally, it is to be expected that a certain amount of dirt, etc., will cling to the filter and thus, reduce its efficiency. A novel arrangement is provided for obtaining access to the filter for its removal from the cleaner without the necessity of having to disassemble the container from its cover. Thus, in the vertical wall 26 of the cover 12, preferably that portion located in the front of the cleaner, there is provided an access opening or slot 86 through which the filter may be removed when deemed necessary. The opening 86 normally is covered by means of door closure assembly 87 disposed over the opening and forming an airtight seal with the external cover surfaces defining the opening. As best shown in FIGS. 1, 3, and 4, the assembly 87 comprises an elongated rectangular-shaped metal door 88 having a rubber seal 89 carried in a peripheral groove 90

of the door so that when the door is in its locked position, the seal abuts the external surface adjacent the access opening 86 (see FIG. 3), thereby providing an airtight closure. The door 88 is held in place by a pair of laterally spaced identical locking subassemblies 91—91 each of which comprises a substantially flat clamping member 92 normally internally disposed for the cover 12 extending across the opening 86 and secured to the inner end of a threaded door clamp shaft 93 mounted for turning movement in an aperture 94 in the door 88, as shown in FIGS. 3 and 4. The clamp 92 is wing-shaped having a flat offset surface 95 formed with an aperture 96 therein. A bolt 97 passes through the aperture 96 and threads into a counterbore 98 provided at the adjacent end of a shaft 93. A washer is placed between the bolt head and the surface 95. The outer or exterior end 99 of the threaded shaft 93 rotatably supports a molded threaded knob 100 and carries a resilient rubber ring 101 located between the knob and the threaded shaft. A retaining ring such as a split washer 102 disposed in an annular recess 103 formed in the shaft end 99 prevents the knob 100 and the rubber ring 101 from becoming disengaged from the shaft. When the door is in its locked position (see FIG. 3), the clamp 92 is disposed so that it is vertically disposed across the cover access opening 86, thus, preventing the door from being removed and the clamp from being drawn through the opening. In this position, the clamp engages an inward extending stop 104 formed on the door, which prevents further rotation of the knob and over-compression of the seal 89. To remove the filter door, each of the threaded knobs 100 is turned by the operator in a direction to relax the compression on the seal 89. Further turning of each knob causes it to engage the rubber ring 101, which binds the knob 100 to the shaft 93 so that any further turning of the knob will produce a 180° rotation (counterclockwise as seen in FIG. 4) of the threaded shaft assembly whereby the clamping member will be rotated to a horizontal position in alignment with the opening 86 permitting ready removal of the filter door. Once the door has been removed, the operator lowers the filter supporting rails by means of the four adjustment screws 81 merely to relax the normal operative sealing engagement of the filter with the seal 85 and reaches into the cover and removes the filter. It will be obvious to those skilled in the art to provide a locking subassembly different from the above, for example, wherein the door may be swung open downward without being detached from the cleaner. In such a construction, the locking means would be pivotally secured at one end to the cover with the other end being attached to the door.

During wet pick-up operation, it is essential that the filter 74 be removed from the cleaner. This is accomplished as described above. Once this has been done and the door assembly secured in place, the cleaner is ready for wet pick-up.

As shown in FIG. 2, the container includes a float valve assembly 105 which, when the liquid 106 reaches a predetermined level in the container 11, will close off the motor-blower inlet opening 33 thereby to prevent any of the liquid from entering the blower section of the motor-blower. As illustrated in FIG. 2, the float valve assembly includes a circular plate seal member 107 comprising an upper rubber portion 108 secured to a bottom steel portion 109. The seal 107 is adapted to cover the intake opening 33 of the motor-blower. The steel portion 109 is welded to a support bracket 110 that is carried on the free end of a pivotally mounted float arm 111. The opposite end of the arm 111 is pivotally mounted on a hinge pin 112 carried by a float arm bracket 113 fastened by suitable means such as a rivet or the like to the wall 26 of the main cover 12. The arm 111 has secured thereto at its lowest extremity a float 114 preferably made of floatable material, such as ethafoam or the like, which is adapted to come into contact with the liquid as it reaches a predetermined level in the con-

tainer thereby to cause the arm 111 to rise as the liquid level rises. At a certain liquid level, the plate seal 107 will be disposed directly adjacent the motor-blower intake 33. Thus, the intake 33 will be closed resulting in an automatic water intake shut-off since the vacuum has been reduced to zero. Thus, no further liquid will be deposited in the container and the cleaner then may be emptied.

To remove the liquid deposited in the container 11, there is provided at the bottom of one of the container walls, in this instance the rear wall was chosen, a removable conventional dump valve generally designated 115 and including a circular seal 116 controlled by a pressure release handle (partially shown) 117. Upon releasing the seal pressure by movement of the handle 117, the valve may be removed completely and the liquid removed from the container without the necessity of removing the container cover.

It is to be understood that the present disclosure relates to a preferred embodiment of the invention, which is for purposes of illustration only, and is not to be construed as a limitation of the invention. The present invention is intended to include all such modifications which do not depart from the spirit thereof.

Having thus described our invention, what we claim is:

1. A suction vacuum cleaner comprising, in combination, a container having a suction inlet therein, a cover removably surmounted on the container in sealed relation therewith, said cover having a filter access opening in its outer side wall and at least one exhaust aperture formed therein spaced from said access opening a motor-blower unit having an air intake portion and an air discharge portion, means for mounting and supporting said motor-blower unit within said cover with said air discharge portion in communication with said exhaust aperture and said air intake portion disposed between said discharge portion and said container suction inlet for drawing air into said container and exhausting the same through said exhaust aperture, a filter assembly including a porous filter, means mounting said filter between said suction inlet and the motor-blower for filtering substantially all the air flowing through said intake portion, said filter access opening being of a greater size and corresponding shape as said filter to readily permit passage of the filter therethrough and located in substantial elevational alignment with said filter, a door normally fastened over the access opening for closing the same and having a normally compressed seal associated therewith for providing a substantially airtight closure with the cover, manually operative means operatively associated with the door for locking and holding the door in its normally fastened position to close the opening and being adapted to be released so that the door may be opened, thereby to allow accessibility to the filter without removal of the cover.

2. The combination in accordance with claim 1 wherein said filter mounting means includes means for adjusting the vertical disposition of the filter from outside the cleaner.

3. The combination as recited in claim 1 wherein said filter mounting means comprises a pair of guide rails, each rail including a support ledge for supporting a peripheral portion of said filter, and means for mounting said rails within said cover adjacent said access opening, said last named means including means for adjusting from outside the cleaner the vertical disposition of said rails and thereby said filter.

4. The combination in accordance with claim 3 wherein the filter is rectangular in shape and the opening has an elongated rectangular shape slightly larger than that of the filter to permit the filter to pass therethrough, said rails being located at opposite ends of said opening and supporting opposite ends of said filter.

5. The combination in accordance with claim 1 wherein said means for holding the door in its normal position relative to the opening comprises a pair of laterally spaced similar locking assemblies, each of which includes a threaded shaft member having an inner and an outer end extending through an aperture in the door, and having at its inner end secured for turning movement with the shaft, a clamping member extending across opposing sides of the opening when the locking assembly is disposed in its normal locked position; thereby to prevent the door from being opened, the outer end of the shaft rotatably supporting a manually operative threaded knob, which when threaded on said shaft in a first direction compresses the seal and when turned in a second direction opposite said first will relax the seal compression, and means on said shaft for binding the knob to the shaft after said seal is substantially relaxed so that further turning of said knob in the second direction will rotate the threaded shaft and thus, the clamping member to a position substantially aligned with the opening, whereby the door may be removed from the opening.

6. The combination in accordance with claim 5 wherein the outer end of said shaft has a reduced non-threaded portion and said last named means includes a rubber ring mounted on the reduced portion of the threaded shaft between the shaft and the knob for providing operative cooperation between the knob and the shaft whereupon when the knob is turned in a direction to relax compression of the seal, the ring will bind the knob to the shaft to produce turning of the shaft.

7. The combination in accordance with claim 5 wherein an abutment integral with the door extends into the opening to provide a stop for the clamp thereby to prevent excessive compression of the seal.

8. A suction vacuum cleaner comprising, in combination, a vertically disposed container having a suction inlet thereto, a cover removably surmounted on the container and including a motor-blower having intake means and discharge means operably mounted in and from the cover, said cover being provided with an elongated rectangular opening in its outer side wall, a filter assembly including a filter to filter the air from the inlet to the intake, said filter having a maximum cross section smaller than said opening cross-section, rail means removably mounting said filter between said inlet and said motor-blower, means for adjustably changing, externally of the cleaner, the position of said rail means and thus the filter relative to the motor-blower, said rail means being located such that the filter may be removed through the opening in the cover without necessitating removal of the cover from the container, an elongated rectangular shaped door removably fastened over the opening in the cover, the door having a normally compressed seal operably associated therewith for providing a substantially airtight closure with the cover, manually operative locking means operably associated with the door to hold the door in a normal locked position for closing the opening and adapted to be unlocked so that the door may be removed from its position over the opening, whereby the opening is accessible to the operator so that the filter may be removed from the cleaner.

9. A suction vacuum cleaner comprising, in combination, a container having an open top and having a suction inlet thereto, a cover being removably surmounted over the top of the container and provided with a normally closed filter access opening in the outer side wall thereof, a motor blower unit, means including a centrally apertured supporting plate secured to the underside of the cover for mounting the motor blower in the cover with the blower intake being aligned with the central aperture, means for communicating the blower discharge externally of the cleaner, a filter assembly including a filter mounted in said cover with the filter transversely slidable through the access opening and across the flow path for filtering the air from the inlet to the intake and being smaller in

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cross-section than the access opening so as to be removed through the access opening and being located directly below the supporting plate, door means removably secured over the access opening and manually operable locking means for holding the door means in position over the access opening and adapted to be manipulated so that the door means may be removed from the opening to facilitate withdrawal of the filter from inside the cleaner.

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U.S. Cl. X.R.

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