

Jan. 22, 1957

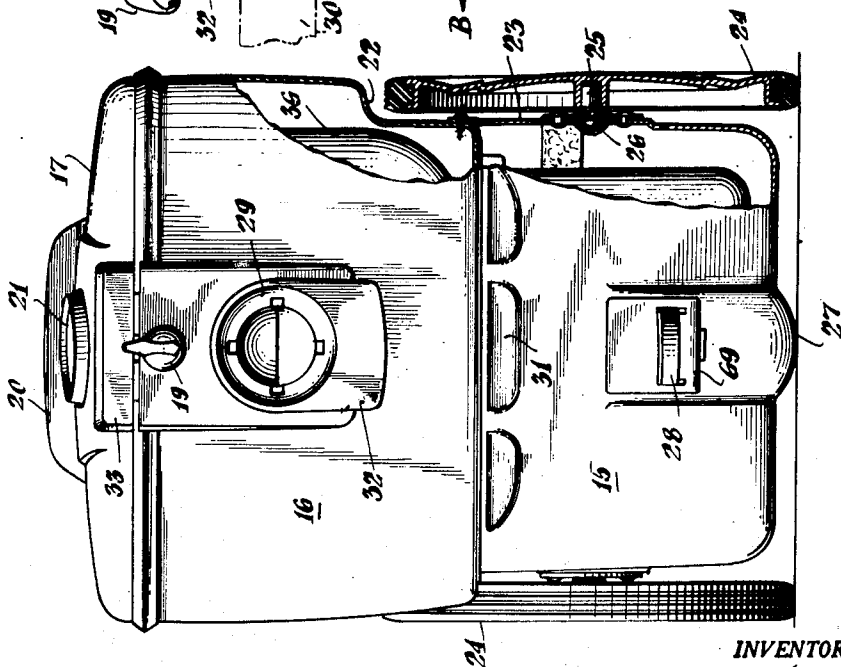
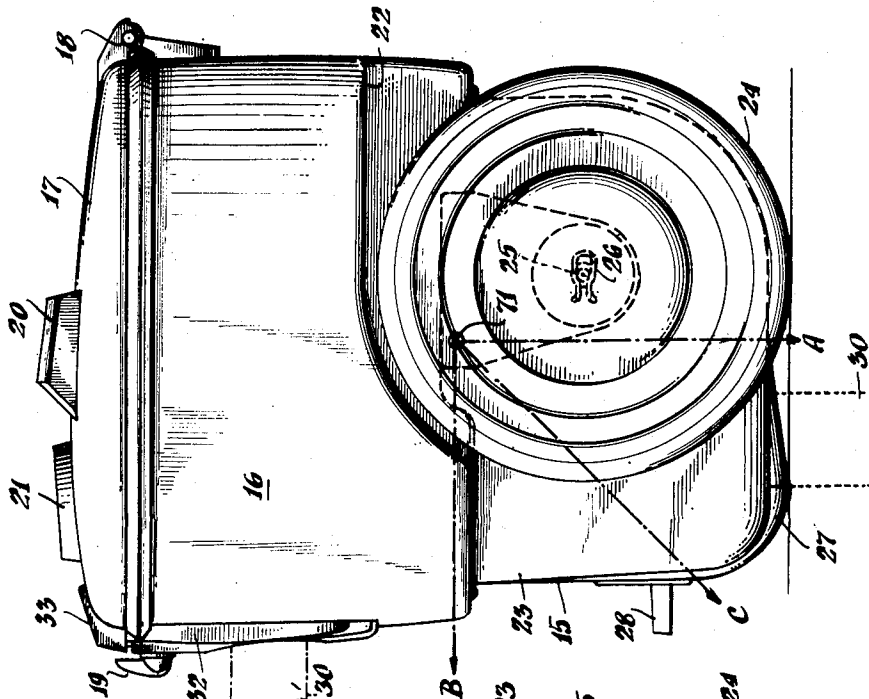
C. E. MEYERHOEFER
VACUUM CLEANER ASSEMBLY

2,778,447

VACUUM CLEANER ASSEMBLY

Filed Oct. 14, 1953

5 Sheets-Sheet 1



INVENTOR.

Carl E. Meyerhoefer
BY Lane, Balsinger and Lane

BY Kane, Balsinger and Kane

ATTORNEYS

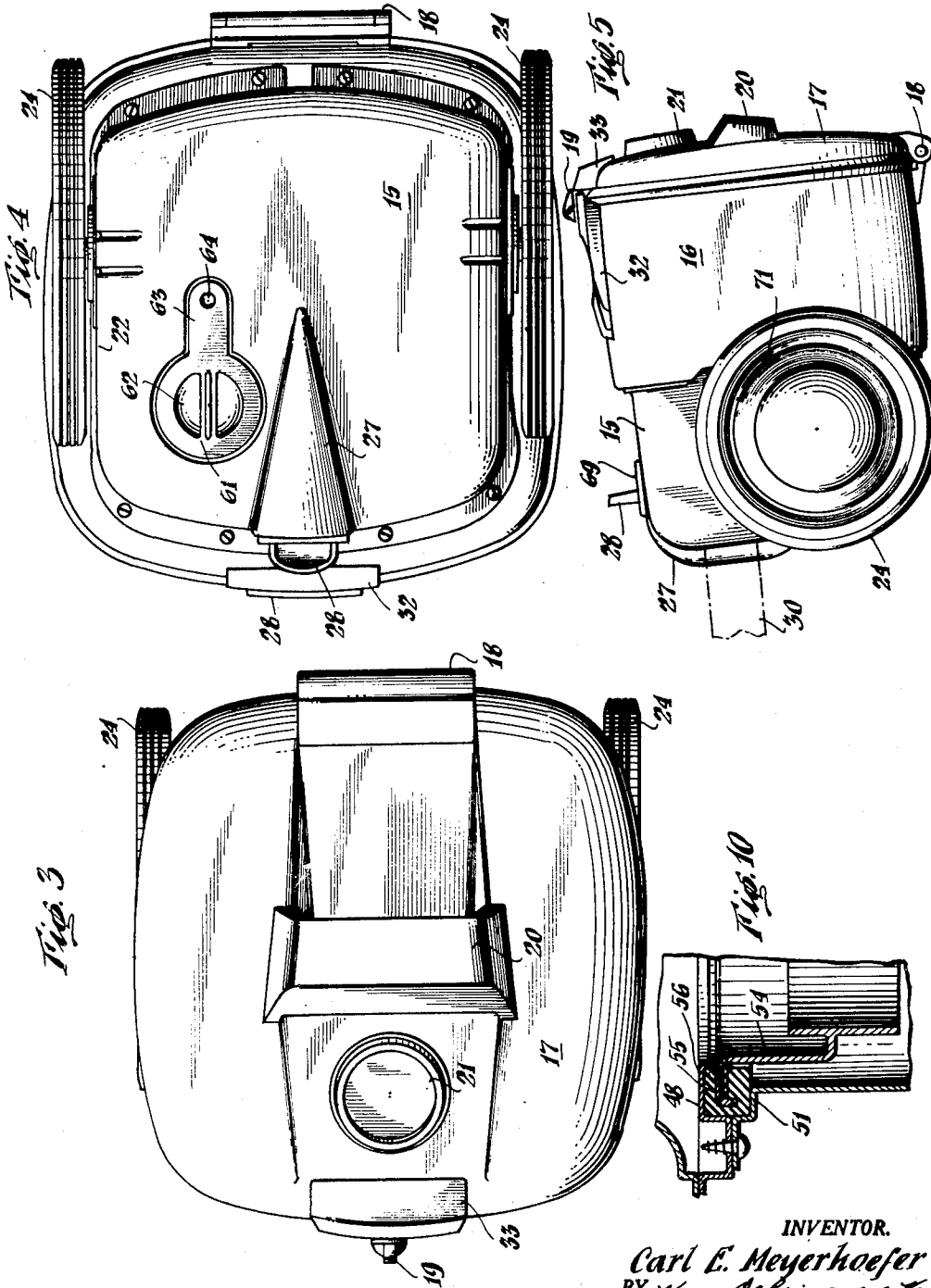
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C. E. MEYERHOEFER
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2,778,447

Filed Oct. 14, 1953

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INVENTOR.
Carl E. Meyerhoefer
BY *Kane, Delima and Lane*

ATTORNEYS

Jan. 22, 1957

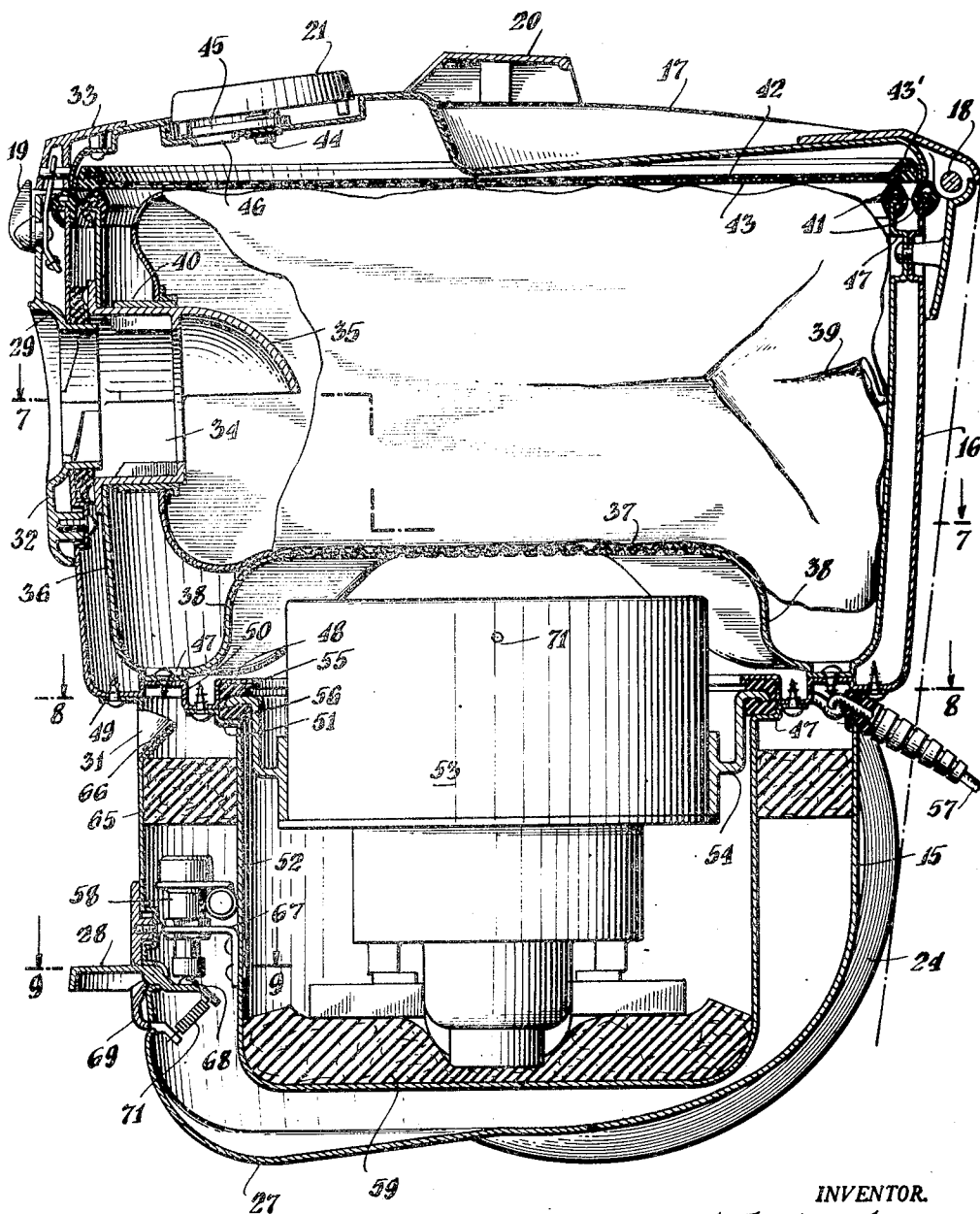
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2,778,447

Filed Oct. 14, 1953

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Fig. 6



INVENTOR.
Carl E. Meyerhoefer
BY *Kane, Salzman and Kane*

ATTORNEYS

Jan. 22, 1957

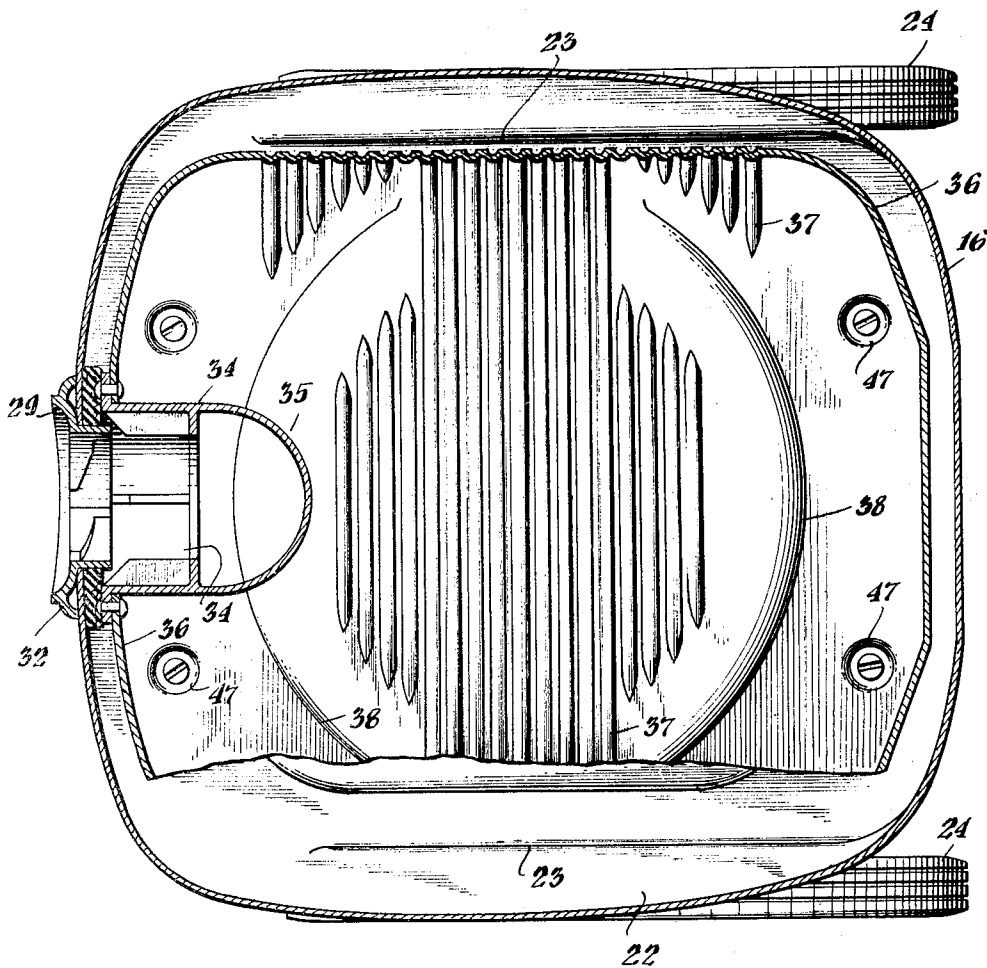
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2,778,447

Filed Oct. 14, 1953

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Fig. 7



INVENTOR.
Carl E. Meyerhoefer
BY *Lore, Balmer and Kane*

ATTORNEYS

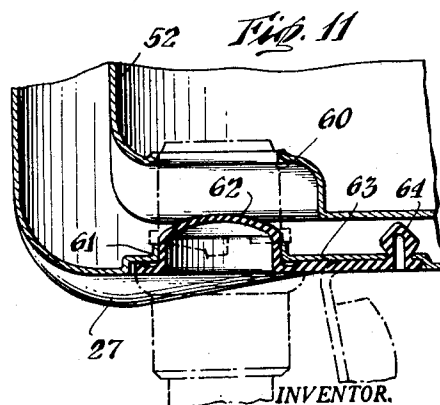
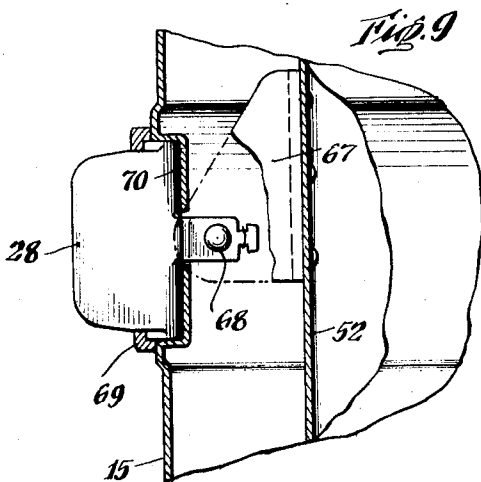
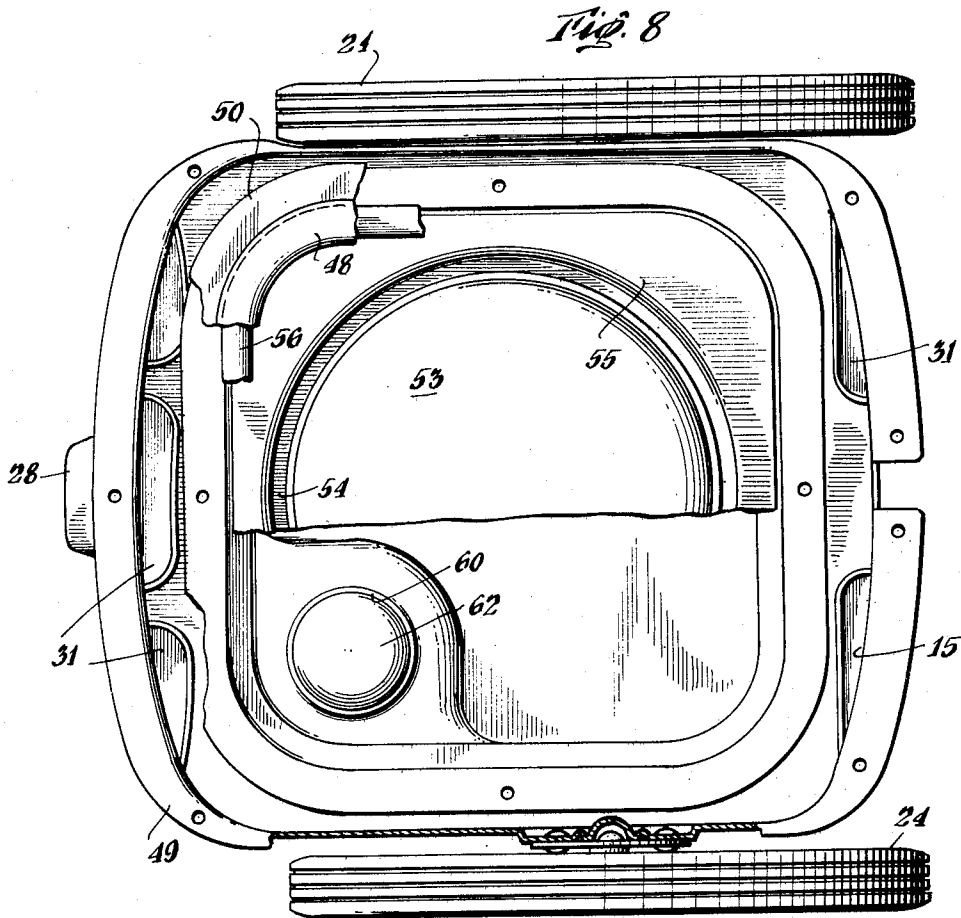
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C. E. MEYERHOEFER
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2,778,447

Filed Oct. 14, 1953

5 Sheets-Sheet 5



INVENTOR.
Carl E. Meyerhoefer
BY *Kane, Saltsman and Kane*

ATTORNEYS

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2,778,447

VACUUM CLEANER ASSEMBLY

Carl E. Meyerhoefer, Brooklyn, N. Y., assignor, by mesne assignments, to Lewyt Corporation, Brooklyn, N. Y., a corporation of New York

Application October 14, 1953, Serial No. 386,077

4 Claims. (Cl. 183—37)

This invention relates to a structurally and functionally improved vacuum cleaner assembly especially of the type used by householders; the present invention embracing an improved and/or alternative structure to that disclosed in my prior applications for United States Letters Patent on Vacuum Cleaners, Ser. Nos. 353,472 filed May 7, 1953 and 371,003 filed July 29, 1953.

It is a primary object of the invention to furnish an improved assembly which may readily be moved over the floor without becoming entangled with the power-supplying lead or cord; the apparatus being inherently stable and—at the will of the operator—permitting of ready shifting and conversion from its usual suction and cleaning functions, to those under which it will supply air under pressure for blowing, spraying and other purposes.

Another object is that of furnishing a vacuum cleaner structure which will be quite compact and in which the passages for the air flow will be arranged in a manner such that a minimum impediment or obstruction to that flow will occur. Moreover, the assembly embraces an improved arrangement such that with minimum effort an operator may readily renew the dust-containing receptacle and filter structure when necessary.

Still another object is that of embodying in a vacuum cleaner structure a layout of parts such that the motor-blower unit will be supported against damaging shocks and will, in turn, not transmit vibration to the assembly or generate perceptible noise beyond a minimum level under normal operation of the cleaner.

An additional object is that of providing a mechanism which will include relatively few parts, each individually simple and rugged in construction and capable of ready assemblage to furnish a unitary apparatus operating over long periods of time with freedom from all difficulties.

With these and other objects in mind, reference is had to the attached sheets of drawings illustrating a practical embodiment of the invention and in which:

Fig. 1 is a front view of the apparatus with certain of the parts broken away to show underlying structures;

Fig. 2 is a side elevation of that apparatus;

Fig. 3 is a top plan view;

Fig. 4 is a bottom plan view;

Fig. 5 shows the disposition of the parts when the assembly is used as a blowing mechanism;

Fig. 6 is a sectional side view in somewhat enlarged scale of the entire apparatus

Figs. 7 and 8 are transverse sectional views taken along the lines 7—7 and 8—8 respectively in the direction of the arrows as indicated in Fig. 6;

Fig. 9 is a sectional fragmentary view taken along the line 9—9 and in the direction of the arrow as also indicated in Fig. 6;

Fig. 10 is a fragmentary sectional side view of a detail of the assembly; and

Fig. 11 is a similar view of another part of the apparatus.

With primary reference to Figs. 1 and 2, it will be seen that the casing of the apparatus includes a lower

2

portion 15 and an upper portion 16. The latter is closed by a lid 17 hingedly supported at 18 and with the opposite side of which a catch mechanism is associated to terminate in an actuator 19 exteriorly of the casing. The lid or cover conveniently supports a handle in the form of an undercut or recessed protuberance 20. A dial unit 21 may also be associated with the cover and shiftable to provide an air by-passing structure of greater or lesser value.

The lower portion of the casing as designated at 15 embraces a cross sectional area of lesser extent than the upper portion 16 thereof. Outwardly bulged surfaces 22 generally define the line of demarcation between these sections. Both sections are preferably of somewhat rectangular outline although, especially in the case of the upper section 16, the configuration may be modified. In any event, it is definitely preferred, in accordance with the present teachings, that flattened side faces 23 extend below the inwardly projecting wall portions 22. The depth of these bulged portions should be such that they will provide recesses for the accommodation of wheels 24 by means of which the entire apparatus is supported for traversal over the floor. These wheels are mounted upon stub shafts 25 which project from faces 23 at points aligned with each other and to the rear of the vertical axis of the apparatus. As shown these wheels may be provided with rubber tire portions and are retained in association with the shafts by detachable clip structures 26. These will serve to prevent an accidental removal of the wheels from the assembly. Also, they will allow the wheels to readily turn. At the same time, when necessary, the clips 26 may be withdrawn from the grooves of shafts 25 to allow of the removal of the wheels. The wheel axis being toward the rear of the apparatus, a skid in the form of an outwardly bulged portion 27 is provided at a point preferably centrally of the bottom section 15 of the casing and adjacent the forward edge of that section. Therefore, it follows that the apparatus as shown especially in Figs. 1 and 2 will have a stable three-point support.

A switch actuator in the form of a foot pedal 28 extends preferably in line with and forwardly of skid 27. The switch thus controlled serves to govern the energization and de-energization of the motor which drives the blower unit of the apparatus. The forward face of casing section 16 is provided with an opening defined by a coupling collar 29. This is the normally used opening to which there is connected a hose 30 for the purpose of providing an operative assembly. A preferred form of this coupling is disclosed in my prior application for United States Letters Patent, Ser. No. 351,072 filed in Washington on April 27, 1953. It is, of course, obvious that an alternative and substitute structure might be employed. In any event, dust-laden air will normally pass through the hose 30 and the coupling to the upper casing section 16. It will flow through the apparatus in a manner hereinafter brought out and during such flow will have the dust and other foreign material separated from it. It will be discharged from the apparatus herein illustrated through ports 31. These preferably form a part of the lower casing section 15 and are provided in the front and rear faces of that section. So provided, they will encompass an aggregate area of around one-third or even less of the perimeter of section 15.

Attention is next invited to Fig. 6 in which it will be seen that a separate facing plate 32 is preferably provided to furnish the coupling collar 29 as well as to mount the latch actuator 19. This plate is secured to the outer face of casing section 16 at the desired position in any manner such as, by example, screws or bolts. A similar and complimentary facing plate 33 is connected to the cover 17. A tube portion 34 is disposed in line with collar 29. This portion extends through the front wall

of a trough or bag receptacle 36 and terminates conveniently in a deflector 35. As shown particularly in Fig. 7, the base and side walls of the trough are ribbed or corrugated as at 37. The central portion of this base is dished inwardly or upwardly so that the forward and rear portions of the trough extend downwardly as indicated at 38. A filter preferably in the form of an air-porous paper bag 39 is disposable in the trough. This bag has its intake opening defined by a collar 40 which encircles and frictionally engages with the outer surface of the tube portion 34. The width of the bag is greater than the distance between the central portion of the trough and its upper edge. The length of the bag should be such that with its collar supported by tube 34, its base will firmly bear against the rear wall of the trough with the bag distended.

Both the upper edges of the trough and section 16 of the casing mount gaskets 41. These gaskets are spaced inwardly of each other toward the axis of the apparatus. The outermost gasket is engaged by the edge of cover 17 when the latter is secured. This cover mounts a filter assembly which in itself would be quite effective, even when used independently of a unit such as bag 39. Preferably the assembly will include an upper perforated metal plate 42 and a lower layer 43 of air-pervious material such as suitable cloth; this layer being in face-to-face contact with plate 42 and the assembly being defined by a gasket 43'. The latter bears in substantially air-tight relationship with the inner face of cover 17 and also supports the assembly. The latter is capable of deliberate detachment from the cover by exerting a pull such that the engagement between the same and beaded edge portion of the cover is overcome. As will be apparent, the inwardly extending portion of cover 17 underlying handle 20 acts as a support to prevent an undesired deflection of the filter grouping embracing plate 42 and layer 43 under conditions of air flow or otherwise. As also shown in Fig. 6, dial 21 is supported for rotation by a shaft 44 supported on the base of a well portion in the cover 17. This shaft mounts for movement with the dial 21, a valve 45; the latter obstructing, partially covering, or clearing an opening 46 in the base of this well. The last-described structure constitutes a suitable air bypass as more particularly disclosed in my prior application, Serial No. 353,472.

The area of trough 36 is less than section 16 of that casing within which it is disposed. Also it is attached against movement with respect to the casing. As especially shown in Fig. 6, adjacent portions of the casing and trough side walls may be provided with spaced groups of opposed pedestal portions 47 which are secured against movement by means of fastening units passing through their base portions. Similar spaced pedestal portions and securing elements are provided (Fig. 7) between the base of the trough and the inwardly extending flange portion of outer casing section 16 which has its edge preferably terminating in the form of a flange 48. At points beyond the latter pedestal portions, the lower section 15 may be flanged outwardly as at 49 and mount fastening elements which secure this section against movement with respect to section 16. Inwardly of the base pedestal portions 47, a channel 50 forms a part of the lower surface of section 16. The upper channeled flange 51 of a tub or casing member 52 is secured in any suitable manner to provide an air-tight seal in contact with the base of channel 50. As will be apparent with especial reference to Fig. 8, the frame defined by the channel members 48 and 51 is substantially rectangular. The same is true of tub 52. Disposed within the latter is the motor-blower unit 53. The configuration of the latter is circular.

In order to couple these parts to each other, an outwardly extending plate or flange 54 is secured to or may form an integral part of the casing defining the blower.

The edge of this plate, as shown in detail in Fig. 10, is preferably extended outwardly and downwardly as at 55. This portion of the plate corresponds in outline to the framing defined by channel elements 50 and 51. It extends into the inwardly facing groove of a gasket 56. The latter is formed of natural or synthetic rubber or similar yielding material. Its normal cross-sectional dimensions are such that it is accommodated between the channel elements 50 and 51 in an uncompressed condition. When the motor-blower unit 53 is not operating the outwardly extending flange portion 55 occupies a position such as has been indicated in dash lines in Fig. 10. With the intake of the motor-blower unit extending upwardly and that unit operating, there will be a tendency of the unit to rise to a slight degree. Therefore, under operating conditions, the parts will assume the positions shown in full lines in Fig. 10 so that the compression on the lower portion of gasket 56 will be relieved and the motor-blower unit will, in effect, be "floatingly" supported by that gasket. At the same time it will be understood that the starting torque of the unit will not result in the latter, through a series of starts, rotating around the axis of the assembly. In this connection, it will be appreciated that the unit has a relatively high starting torque so that each time operation is initiated, there is a definite tendency on the part of the unit to turn through several degrees. Such a condition would involve substantial complication because the power-supplying lead 57, which is in circuit with the switch 58 and the motor of the unit, would tend to be increasingly disposed within or drawn into the casing. Such difficulties are precluded in the present structure because, while the unit is circular in outline and would hence tend to rotate due to the character of the connection between its body and the gasket 56, the latter and the plate 54 are not circular in outline. Accordingly, when motor operation is initiated, an axial turning of the unit through several degrees may occur but this will result in a torsional strain being imparted to the material of gasket 56. Immediately after the unit has reached proper operating speed, this strain will be relieved by the parts returning to their initial positions. With the gasket and the structure associated therewith providing the desired mounting for the unit, an escape of air between the upper portion of that unit and past the gasket will be prevented in that the surfaces under all operating conditions establish proper air-tight relationship. While still considering this portion of the apparatus, it will be noted that the upper or intake end of the unit extends into the dished-in central portion of the trough base and is spaced therefrom with its side faces also being spaced from the adjacent outwardly extending portions 38 of the trough which overlap it. Below the motor unit a filtering or entrapping structure is furnished by providing a body 59 of material such as fiberglass. The latter does not serve to support the unit; this function being achieved by the aforescribed gasket assembly.

As shown especially in Fig. 11, the base of tub 52 is preferably provided with a recessed portion within which there is defined an opening 60. In line with this opening and to one side of the skid 27, the base of section 15 is provided with a similar opening. This is defined by a collar 61 corresponding to collar 29 and with which the inner end of the coupling member carried by the hose assembly is connected. Normally the bore of collar 61 is closed by a preferably rubber cap 62 with which a flexible strap 63 is coupled. This strap has its outer end connected by a suitable fitting 64 with the wall of casing section 15. Therefore, the cap will never be wholly detached from the casing while at the same time it may readily be shifted to permit of a coupling of the hose with the interior of tub 52 as indicated in dot and dash lines in this figure. With the end of the hose not normally being in this position and cap 62 sealing collar 61, air will freely flow from the motor-blower unit through opening 60 and along the adjacent surfaces of casing sec-

5

tion 15. Such flow will occur upwardly toward the ports 31. A final filter in the form of a ring 65 being disposed between the tub and casing at a point short of these ports, it follows that the air will pass through this unit (of fiberglass or other suitable material) before it escapes from the ports. The latter may be defined by inwardly struck portions 66.

The assembly of the switch 58 is such that when its operating element is initially actuated, the circuit through the switch is closed. A subsequent actuation results in the parts shifting so that the switch is open. The next operation again closes the switch, etc. According to the present teachings, this switch is preferably mounted upon a bracket 67 secured to the forward face of tub 52. Actuator 28 is provided with a rear or inwardly extending arm 68 lying adjacent the operating portion of the switch. A plate 69 is secured to the outer face of casing portion 15 and has a slot through which actuator 28 extends. In line with this plate the casing is dished inwardly to furnish a recess within which a trunion portion forming a part of the actuator 28 extends. Accordingly the latter is mounted for rocking movement as especially shown in Figs. 6 and 9. A spring 71 of the contraction type is connected between the end of arm 68 and an inwardly extending portion of plate 69. Thus actuator 28 is normally supported in the position illustrated. It may, however, be swung to cause an operation of the mechanism of switch 28 and spring 71 will return the parts to normal positions.

Finally, as will be observed in Figs. 2 and 5, the center of gravity of the entire assembly in its two extreme positions has been indicated by the numeral 71. With the apparatus in its normal or upright position and as shown in Fig. 2, this center of gravity will lie somewhat above and slightly forward of the wheel axes 25. Therefore the three-point support upon the floor as afore noted will be maintained. When the assembly is rotated in a clockwise direction as shown in Fig. 2 and assumes the position shown in Fig. 5, it will still have a stable three-point support upon the floor. The wheels will provide two of these points of support and the third point in the latter figure may conveniently include the housing defining the hinge area 18. In any event, with the parts in the Fig. 5 position, the center of gravity will still be maintained above the axis of the wheels but will have shifted to the rear of a line extending perpendicular with respect to the floor and through such axis.

Assuming a bag to be properly positioned within the trough as shown in Fig. 6, with the lid closed and the apparatus in its normal or upright position, the line of thrust will be directly below the center of gravity 71; such line having been indicated at A in Fig. 2. With the hose 30 connected to collar 29 and an operator exerting a pull upon this hose, a traction or pulling force will be exerted in the direction of line B as indicated in Fig. 2. The components of the latter line and line A has been indicated at C in this same figure. Therefore an operator, grasping the hose and moving in a forward direction, will cause the entire assembly to shift over the supporting floor in a path which tends to directly follow that traversed by the operator.

Now with the motor-blower unit 53 energized by closing the mechanism of switch 58, it follows that dust-laden air will enter through the hose and tube 34 and flow into the interior of bag 39. If the operator has not already properly expanded this unit, the inflowing air will cause such expansion so that it will assume the position shown in Fig. 6. The air will escape through the wall of the bag and in such escape will have dust particles and other foreign material filtered from it to the greatest extent. Incident to the corrugations or ribs 37 the side and bottom as well as the top faces of the bag will act as a filter in that air may escape through them. In any event, the trough 36 presenting a base and side walls, it follows

6

that the filtered air will now be confined by the innermost gasket 41 to a path such that it must flow through the filter assembly comprising cloth 43 and plate 42. Thus, it is subjected to a further filtering action and passes into the space intervening plate 42 and the inner face of lid or cover 17.

Within that cover zone, it will reverse its flow. Also, according to the setting of the dial or actuator 21, a greater or lesser amount of air may directly enter this space. The greater amount of the air passing through opening 46, the less will be the amount of air entering through collar 29. With valve 45 sealing opening 46, all air will enter through that collar. The air within the zone of cover 17 will now flow downwardly towards the spaces intervening the upper section 16 of the casing and the trough 36. In reaching these passages, the air will again pass through the filter assembly constituted by plate 42 and layer 43. Therefore, it will be subjected to a further filtering action. As will be apparent with the dust-separating action which does occur as a consequence of this assembly, the bag 39 might, in certain instances, be dispensed with and the filter assembly 42-43 might perform the entire filtering action. In that event, the structure of the trough might be modified and the structure of the assembly also redesigned. According to the preferred aspect of the invention, however, both the bag as well as the assembly should be used and the air should flow in series through these units.

In any event as shown to best advantage in Figs. 6 and 7, the air will now pass around the sides of the trough 36 as well as around the downwardly extended end portions 38 of the same and will move into the space defined between the base of the trough and the intake end of the motor-blower unit 53. In escaping from or being discharged by the latter, the air will flow toward the mass of material 59. Any particles of foreign material still entrained within the air will move into contact with body 59 and adhere to or become embedded within the same. Thus a particle-retaining structure is presented at this point and the tub 52 will constitute a plenum chamber to confine the flow of air so that it must pass through opening 60 in line with cap 62. Cover 17, cloth 43 and plate 42 extending over the marginal space between trough 36 and casing 16 provide for the aforementioned air flow.

With cap 62 being in position, the air will flow into the space intervening casing section 15 and tub 52. It will move upwardly through the ring or mass of material 65. Therefore again at this point it will be subjected to a filtering action. Additionally, this material will act to suppress the noise occurring incident to the flow of air toward and through the opening 60 and toward and through the ports 31. These ports being located in the forward and rear faces of the assembly, the air escaping from them will generate far less sound than would be the case if the air discharged, for example, against surfaces such as the inner faces of the wheels 24. Therefore, objections in connection with the noise incident to air flow and escape will be substantially completely overcome.

At the same time, noise incident to the vibration transmitted to the apparatus from the motor blower unit will also, in effect, be nullified. This will be because of the free-floating support furnished by gasket 51 and its associated structure. As afore brought out, each time the motor-blower unit is started, this part of the apparatus allows of that unit moving around the axis of the apparatus for a few degrees to thus minimize the shock of starting. However, due to the fact that a non-circular configuration is provided as part of the flange or plate 54 extending from the unit, the latter will always return to its initial position and will not rotate through an increasing path as a number of starting and stopping operations occur. With this in mind, the continuation of lead

57 extending to switch 58 and the motor-blower unit may be of minimum length such that it will not strike against adjacent surfaces as the apparatus is moved and thus cause unnecessary noise.

The actuator 28 may be readily operated in all positions which the apparatus assumes. Under normal conditions, as illustrated in Figs. 1 and 2, the operator's foot may cause a ready control of the circuit. As afore brought out, the assembly will follow the operator as the latter pulls—without conscious effort—upon the end of hose 30 incident to cleaning the floor, walls or other surfaces. With the mechanism disposed substantially centrally within a room and the operator moving around that room, the cleaner will simply rotate substantially around a vertical axis. The wheels 24 under these circumstances will freely pass over any portions of the lead 57 which may rest upon the floor and will not become entangled with this part or similar obstructions on the floor. Therefore, it will be unnecessary to employ a so-called "swivel-top" structure with its inherent loss of efficiency due to unavoidable air leakages at the rotatable joint, which in other cleaners enables the operator to circle around the room without difficulties being encountered.

Also, the operator may lift the outer end of the hose to a relatively elevated position such as might be necessary in cleaning adjacent the ceiling of a room without there being any danger of the apparatus becoming over-balanced. However, if a deliberate lift is exerted on that portion of the hose which is adjacent collar 29, or if the apparatus is otherwise forced in a clockwise direction as viewed in Figs. 2 and 6, then the entire assembly will rotate around the wheel axes 25 to come to rest in the position shown in Fig. 5. This will readily be possible because the rear face of casing section 15 is, according to the present invention, curved to extend along a radius less than that of wheels 24 which accordingly have their peripheries extending beyond that casing face. Therefore, the tilting action occurs without the outer face of the casing obstructing this function.

When the apparatus is disposed as in Fig. 5, a three-point support is again furnished. Actuator 28 is readily accessible for the purpose of controlling switch 58. The hose fitting may be readily detached from collar 29 and cover 62 may be swung to its inoperative position. Thereupon the hose fitting is introduced through collar 61 to extend in sealing engagement with the edges defining opening 60 of tub 52. This has been shown in dotted lines in Fig. 11. Under these circumstances, all air will be discharged under pressure directly from the tub and through the hose. The operator may manipulate the latter as necessary for blowing or spraying purposes without fear that the apparatus will become over-balanced. This is because a completely stable supporting structure is furnished having in mind the contact of the two wheels 24 with the floor, the location of the center of gravity 71 between these wheels and the third point of support such as hinge portion 18 or any suitable equivalent surface.

Thus, among others, the several objects of the invention as specifically aforementioned are achieved. Obviously numerous changes in construction and re-arrangements of the parts might be resorted to without departing from the spirit of the invention as defined by the claims:

I claim:

1. A vacuum cleaner assembly including in combination a casing formed with an inlet opening adjacent its upper end, means mounted adjacent said opening to provide a detachable coupling for the end of a hose, wheels connected with the casing and extending adjacent and below the latter to support the same at two spaced points, a further support extending from said casing between said wheels and substantially in line with said inlet opening, a motor-blower unit within said casing adjacent its lower end, a filter between said unit and inlet opening, the center of gravity of said assembly being disposed above the

axis of said wheels, a cover hingedly connected with said casing at a point adjacent the upper end of the latter, said casing being rotatable around the wheel axis to bear against a supporting surface at a point adjacent that at which said cover is hingedly connected, said casing being formed with an opening in its lower face, a cap closing such opening and means disposed adjacent said opening and providing a coupling for a hose connectible therewith.

2. A vacuum cleaner assembly including in combination a casing presenting a base and side walls, said casing being formed with an inlet opening in its side wall adjacent its upper end, a motor-blower unit mounted by said casing adjacent its lower end and below said inlet opening, a filter mounting disposed between said opening and unit, wheels extending beyond the outer face of said side walls to each side of said casing, a support extending from the base of said casing between said wheels and substantially in line with said opening, the center of gravity of said assembly being disposed above the axis of said wheels and toward said opening whereby a pull on said casing in the zone of said opening will cause said assembly to traverse a supporting surface with two points of mounting provided by the wheel peripheries and with the support extending from said base firmly and slidably engaging that surface and said casing at a point between said wheels and opposite said opening being rounded along a radius of lesser value than that defined by the peripheries of said wheels whereby said casing may be rotated in a rearward direction around the wheel axis and supported by the two peripheral wheel portions to cause said support to rock out of contact with the supporting surface and cause the axis of said assembly to assume a position substantially parallel to said supporting surface and a part, adjacent the upper end of said casing side wall, engaging such supporting surface and furnishing—under such latter conditions—a third point of support for said casing.

3. A vacuum cleaner assembly including in combination a casing presenting connected upper and lower portions defined by side walls, and an imperforate trough mounted within said upper portion to extend horizontally across the same, said trough and the side walls of said upper casing portion being formed with aligned and connecting inlet openings, the outer face of said trough being spaced from the inner face of said upper casing portion to provide spaces for the passage of air—after it has flowed upwardly and over the upper edges of the trough—in a downward direction, a motor-blower unit mounted within the lower casing portion to receive air moving through said spaces, said unit having its axis extending in a vertical direction, said lower casing portion having a width less than said upper casing portion and including substantially flat side faces recessed with respect to said latter portion, wheels rotatably mounted adjacent said flat faces within a space below and encompassed by the area of said upper casing portion and said wheels having a diameter such that they extend from a point below said lower casing portion to a point substantially midway of the height of said casing.

4. A vacuum cleaner assembly including in combination a casing presenting connected upper and lower portions defined by side walls, and an imperforate trough mounted within said upper portion to extend horizontally across the same, said trough and the side walls of said upper casing portion being formed with aligned and connecting inlet openings, the outer face of said trough being spaced from the inner face of said upper casing portion to provide spaces for the passage of air—after it has flowed upwardly and over the upper edges of the trough—in a downward direction, a motor-blower unit mounted within the lower casing portion to receive air moving through said spaces, said unit having its axis extending in a vertical direction, said lower casing portion having a width less than said upper casing portion and including

substantially flat side faces recessed with respect to said latter portion, wheels rotatably mounted adjacent said flat faces within a space below and encompassed by the area of said upper casing portion, and said lower casing portion being formed with outlet openings extending 5 through its side walls at points intermediate its flat side faces whereby air discharged through said outlet openings will not be directed against said wheels.

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