

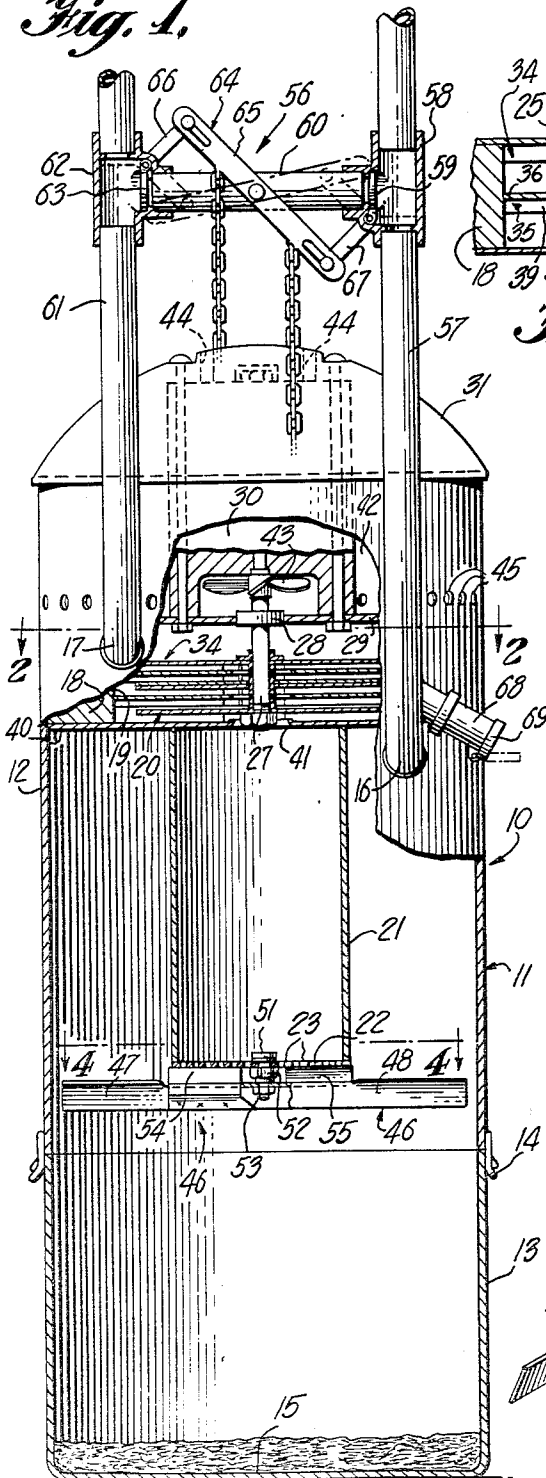
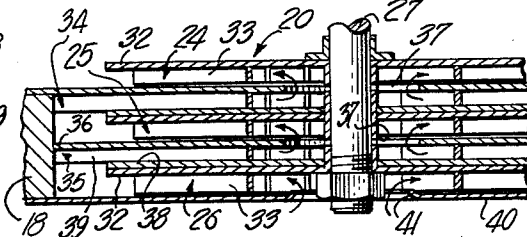
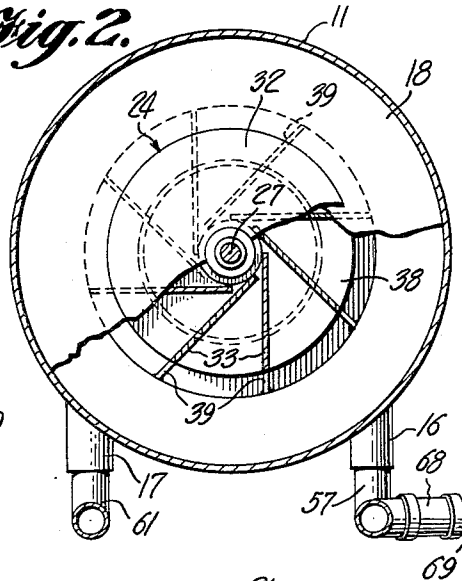
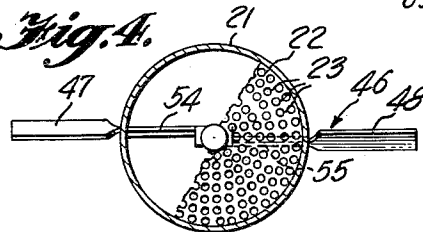
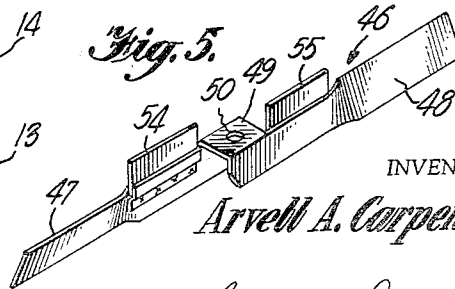
June 28, 1960

A. A. CARPENTER

2,942,690

CENTRAL VACUUM CLEANING UNIT

Filed Dec. 18, 1958



INVENTOR

Arvell A. Carpenter

BY *Mason, Fenwick & Lawrence*
ATTORNEYS

1

2,942,690

CENTRAL VACUUM CLEANING UNIT

Arvell A. Carpenter, 6904 S. Country Club Drive,
Oklahoma City, Okla.

Filed Dec. 18, 1958, Ser. No. 781,256

3 Claims. (Cl. 183—37)

The present invention relates in general to cleaning apparatus, and more particularly to vacuum cleaning apparatus designed especially for central built-in cleaning systems.

Portable home vacuum cleaners have been in wide use for many years for domestic and building cleaning purposes. These portable cleaners as commercially produced are primarily of two basic types, the bag type and the tank type. The bag type conventionally includes a wheel supported cleaning head or brush having a motor-driven impeller or fan incorporated therein, a handle pivoted at its lower end to the cleaning head, and a collecting bag removably supported at one end on the handle and coupled at the other end to the exhaust duct of the impeller. The tank type of cleaner conventionally employs an elongated horizontal or upright tank adapted to rest on the floor, having the motor-driven impeller and collecting bag housed within the tank and inlet and exhaust openings. The cleaning heads or cleaning attachments are supported on one end of a tubular handle and a flexible hose extends from the other end of the handle to the inlet opening of the tank.

Both of these basic types of portable vacuum cleaners must be moved from room-to-room and the electrical supply cord providing current for the motor-driven impeller must be coupled and decoupled with the electrical convenience outlet socket in the various rooms as the cleaner is moved about the house or building. In both of these basic types of cleaners, the dustladen air drawn in through the cleaning head by the impeller is discharged into the same room in which the cleaner is used, after varying amounts of dust and dirt are filtered out by the walls of the collecting bag. Also, the effective suction in the cleaning head produced by the impeller diminishes rapidly during the initial stages of use of the cleaner, due to the collection of dust and dirt on the walls of the collecting bag in the path of the air being drawn through the cleaner and the rapid reduction in the porosity of the walls of the collecting bag produced by this accumulation of dust and dirt.

Additionally, it has been found desirable in many instances to render the cleaning unit adaptable to serve as an air blower or source of propelled air under pressure as well as an air suction device. This becomes particularly desirable where the cleaning unit is installed as a built-in appliance having a central impeller and dirt-collecting unit and connecting ducting built into the walls of the building having outlet connections in each of the rooms to be serviced by the central cleaning device.

An object of the present invention is the provision of a novel vacuum cleaning apparatus for use in association with a ducting system installed in the walls or partitions of a multiroom building and extending to a plurality of rooms to be cleaned, wherein the vacuum cleaning apparatus may be located remote from the rooms while the cleaning attachments to be directly used in the cleaning operation may be removably coupled to outlets of the ducting system in the rooms to be serviced.

2

Another object of the present invention is the provision of a central vacuum cleaning apparatus for use in built-in domestic cleaning installations, wherein novel means are provided for effectively separating the dust and dirt collected by the cleaning head out of the suction air stream and for displacement of the separated dust and dirt from the path of air travel to minimize reduction of the effective suction in the cleaning head by accumulation of such dust and dirt.

Another object of the present invention is the provision of a central vacuum cleaning apparatus for use in built-in domestic cleaning systems, wherein means are provided for readily conditioning the apparatus for use as either an air blower to supply forced air under pressure to a built-in ducting system or as an air suction source to provide the necessary suction for cleaning attachments to be used in the rooms.

Other objects, advantages and capabilities of the present invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawing illustrating only preferred embodiments of the invention.

In the drawing:

Figure 1 is a side elevation of a central vacuum cleaning unit embodying the present invention, with portions broken away to reveal the interior of the unit;

Figure 2 is a horizontal transverse section view taken along the line 2—2 of Figure 1;

Figure 3 is an enlarged fragmentary section view of the impeller structure;

Figure 4 is a transverse section view taken along the line 4—4 of Figure 1, wherein a portion of the perforated bottom wall of the stack is broken away; and

Figure 5 is a perspective view of the rotor assembly for dislodging accumulated dust and dirt from the lower surface of the perforated bottom wall of the stack.

Referring to the drawing, wherein like reference characters designate corresponding parts throughout the several figures, the central vacuum cleaner unit, indicated generally by the reference character 10, normally will be disposed in a shed externally of a house, in a garage or other location wherein the air discharged from the unit 10 may be dissipated to outside air. The unit is housed in a generally cylindrical casing 11 having an upper section 12 and a lower section 13 which are separable from each other and are removably secured together in vertical axial alignment by conventional toggle locks or latches 14. The lower casing section 13 has a bottom 15 and is in the form of an upwardly opening receptacle designed to receive and collect dust and dirt drawn into the unit 10.

The upper section 12 of the casing 11 has an inlet opening 16 and an exhaust opening 17 spaced vertically and offset laterally from the inlet opening 16 extending through the side wall thereof. A transverse partition 18 extends entirely across the upper casing section 12 and is located vertically between the inlet opening 16 and exhaust opening 17. The transverse partition 18 is provided with a large cylindrical opening 19 in the center thereof for housing an impeller assembly generally indicated at 20, and depending from the transverse partition 18 is a vacuum stack or cylinder 21 having its upper end fixed to the transverse partition 18 and a perforated lower wall 22 extending entirely across the stack 21 and having openings 23 therein.

The impeller assembly 20 includes a plurality of driven impeller blades 24, 25 and 26 each fixed to a driven shaft 27 extending through a bearing 28 in a transverse wall 29 and depending from an electric motor 30 disposed above the transverse wall 29 and fixed to the dome-shaped top 31 of the casing 11. The impeller blades each comprise a disk-shaped base 32 which is

perforated at its center to snugly accommodate the driven shaft 27 and a plurality of depending vanes 33 which extend from near the center of the impeller blade to one peripheral edge thereof along tangents to a circle concentric with the driven shaft 27 and having a slightly greater radius than the radius of the shaft 27. The configuration of the depending vanes 33 is illustrated in Figure 2.

Cooperating with the impeller blades 24, 25 and 26 are stationary diverters 34 and 35 which comprise an upper annular wall 36 fixed at its outer periphery to the transverse partition 18 and having a central opening 37 surrounding the driven shaft 27 and spaced therefrom, a lower annular wall 38 having its outer periphery corresponding to the outer periphery of the base 32 of the impeller blades 24, 25 and 26 and of smaller diameter than the cylindrical opening 19 in the transverse partition 18, and vertically disposed vanes 39 which extend from the bounding surface of the cylindrical opening 19 inwardly to a point spaced from the driven shaft 27 along paths corresponding to the paths of the vanes 33. A baffle 40 which is centrally apertured at 41 to provide an inlet opening for drawing air upwardly into the lower impeller 26 from the vacuum stack 21, as indicated by the arrows in Figure 3, is carried on the lower surface of the transverse partition 18.

It will be noted that the transverse wall 29 defines the upper limit of the space within the casing 11 in which the air drawn by the impeller assembly 20 may flow, and forms the bottom closure for a motor compartment 42 within which the electric motor is provided with a fan 43 disposed above the bearing 28 in the wall 29 to effect ventilation of the motor 30, the air which is drawn through the opening 44 in the top 31 of the casing being circulated in isolated relation to the air below the wall 29 and discharged from the casing 11 through the annular series of ventilating openings 45 formed in the side wall of the upper casing section 12 immediately above the transverse wall 29.

In order to insure dislodgment of the dust and dirt and other foreign matter from the perforated bottom wall 22 of the stack 21, which dust and dirt is entrained in the air sucked in through the inlet opening 16 from the remote vacuum cleaning attachment, the air driven rotor assembly, indicated generally by the reference character 46 is provided on the lower wall 22. The rotor assembly 46 comprises a pair of appropriately pitched and oppositely extending rotor blades 47, 48 connected at the center of the rotor assembly by a bridging plate 49 having an opening 50 therein through which a stub shaft or threaded bolt 51 extends. The stub shaft or bolt 51 is mounted on the bottom wall 22 of the stack 21 at the center of the wall 22, as by means of a head on the bolt 51 and a nut 52 threaded thereon, so that a portion of the bolt 51 depends from the wall 22. The rotor blades 47, 48 are freely rotatable on the bolt 51 and are held thereon by suitable means such as the nut 53, so as to space the rotor blades 47, 48 a selected distance below the perforated wall 22. The portions of the rotor blades 47, 48 immediately adjacent the center of the rotor assembly carry upstanding scraper members 54, 55 which may be formed of a variety of materials such as sheet metal, rubber or resiliently deformable plastic stock, or the like, the upper edges of the scraper members 54, 55 extending into contact with the lower surface of the wall 22. The rotor assembly 46 is designed to be rotated about the bolt 51 by the force of the air stream created by the motor-driven impeller 20, to thus rotate the scraper members 54, 55 along the lower surface of the wall 22 and dislodging any accumulated material therefrom so that it will drop into the lower section 13 of the casing 11.

A valve by-pass arrangement generally indicated by the reference character 56 may be provided to permit the unit to be used either as a suction unit or as a blower unit. To this end, the pipe 57 connecting the inlet opening 16

with the convenience outlets in the rooms of the house is provided with a valve fitting 58 having a valve member 59 therein pivotable from the solid line position illustrated in Figure 1 wherein it closes a by-pass pipe 60 coupled to the fitting 58, to the dotted line position shown in Figure 1 wherein it closes the pipe 57 below its junction with the by-pass pipe 60. Likewise, the exhaust pipe 61 which extends from the exhaust opening 17 to outside air is provided with a similar but inverted T-shaped valve fitting 62 having a valve member 63 therein, and also coupled with the by-pass pipe 60. The valve member 63 is pivoted for movement from the solid line position illustrated in Figure 1 wherein it closes the by-pass pipe 60, to the dotted line position wherein it closes the exhaust pipe 61 above the juncture of the by-pass pipe 60 therewith. Movement of these valve members 59, 63 may be conveniently coordinated by the linkage system 64 illustrated in Figure 1 including a centrally pivoted lever 65 on the by-pass pipe 60 having pin and slot connections with radial arms 66, 67 controlling rotation of the valve members. This linkage system 64 is arranged so that, when the lever 65 is in the solid line position, the valve members 59 and 63 close both ends of the by-pass pipe 60 and the inlet and exhaust openings 16, 17 are connected in normal fashion with the convenience outlets and outside air, respectively. When the lever 65 is shifted to the dotted line position, the valve members 59, 63 are shifted to their dotted line positions as described above to connect the exhaust opening 17 through the by-pass pipe 60 with the upper section of the inlet pipe 57 extending to the convenience outlets. The inlet pipe 57 immediately adjacent the inlet opening 16 has a branch section 68 connecting therewith and capped by a manually operable closure or valve 69 which may be opened to the dotted line position when the lever 65 is at its dotted line position and thereby vent the inlet opening 16 to air.

It will be understood that the built-in conduit system in the home or building consists of a series of conduits extending from a wall near the location of the central cleaning unit 10 to the various rooms of the building and suitable convenience outlets will be provided in a wall of each of the rooms to provide a separable sealing connection with a flexible hose to the other end of which conventional cleaning attachments may be connected.

Upon energization of the electric motor 30, the impeller blades 24, 25 and 26 will be driven through the shaft 27 to draw air into the casing through the inlet opening 16 and thence downwardly into the lower casing section 13 and then upwardly through the perforated wall 22 and stack 21. Upon passage through the opening 41 in the partition 18, the air is forced outwardly along the vanes 33 of the lowermost impeller blade 26, thence upwardly about the outer peripheries of the lowermost impeller blade base 32 and lower diverter wall 38, thence inwardly along the diverter vanes 39 and upwardly through the opening 37 defined between the inner edge of the upper diverter wall 36 and the surface of the driven shaft 27 and outwardly again in a similar cycle through the next impeller blade 25. This radially outwardly and then inwardly cycling of the air is repeated through the next stationary diverter 34 and the uppermost impeller blade 24 and the air is discharged into the space between the upper surface of the transverse partition 18 and the transverse wall 29 from which it is exhausted through the exhaust opening 17. A portion of the dust and dirt which is entrained in the air drawn in through the inlet opening 16 falls under the force of gravity into the lower portion of the lower casing section 13 while the air freed of this entrained dust and dirt is drawn upwardly through the perforated wall 22 and thence through the stack 21 to the exhaust opening 17. Also, a significant portion of the dust and dirt in the air will deposit on the lower surface of the wall 22, and will be promptly dislodged by the scraper mem-

bers 54, 55 rotated by the action of the moving air on the blades 47, 48 and fall into the lower section 13. In this manner the heavier dirt and dust drawn in by the cleaning head and through the inlet opening 16 is dislodged from the air stream to minimize the building up of a layer of such dust and dirt particles across the duct through which the air is drawn which would appreciably reduce the suction generated by the impeller unit 20 as operation continues.

Also, due to the presence of the transverse wall 29 isolating the motor compartment 42 from the chambers within the casing 11 through which the vacuum stream flows, clean air from externally of the casing 11 may be drawn in through the openings 44 in the dome-shaped top 31 and about the motor 30 by the fan 43 and discharged through the openings 45, and the motor will be protected against any contamination by residual dust in the air discharged by the impeller blades 24, 25 and 26.

As a practical matter, a 1 $\frac{3}{4}$ horse single phase A.C. motor running at about 15,000 r.p.m. may be practically employed in this unit and will provide about four to seven times the suction available in conventional domestic vacuum cleaner units. Thus, not only is a much greater cleaning suction made available by this system, but the suction which is produced is not rapidly diminished, as it is in conventional vacuum cleaners by the production of a baffle of rapidly diminishing porosity across the air stream due to the accumulation of dust and dirt particles.

While only one preferred embodiment of the invention has been particularly shown and described, it is apparent that other modifications may be made in the invention without departing from the spirit and scope thereof, and it is desired, therefore, that only such limitations shall be placed thereon as are imposed by the prior art and are set forth in the appended claims.

What is claimed is:

1. Suction cleaner apparatus comprising a casing having a separable bottom section forming a receptacle for collecting dirt from dirt-laden air drawn into the casing, said casing having an air inlet opening and an air exhaust opening spaced above said bottom section, motor driven impeller means within said casing for drawing air through said inlet opening and discharging the same through said exhaust opening, a vertically arranged duct member depending from said impeller means and forming an inner air up-take chamber, said duct member terminating at its lower end in a transversely arranged, horizontal, perforated bottom wall forming a dust separating baffle extending entirely over the area of the duct member, an outer annular down-take duct for dirt-laden air extending in concentric relation with the inner duct member to convey air from said inlet opening downwardly about the inner duct member and into said lower section and thence upwardly through said up-take chamber and said impeller means, scraper means rotatably supported in depending relation from said perforated wall having scraping surfaces engaging the lower surface of said wall to scrape the lower surface of said perforated wall upon rotation of said scraper means, and means responsive to air flow within said casing for rotatably driving said scraper means to cause the scraping edges thereof to sweep the area of said perforated wall.

2. Suction cleaner apparatus comprising a casing having a separable bottom section forming a receptacle for collecting dirt and like foreign matter from dirty air drawn into the casing, said casing having an air inlet opening and an exhaust opening spaced vertically from

each other and spaced above said bottom section, motor-driven impeller means within said casing for drawing air through said inlet opening and discharging the same through said exhaust opening, a vertically extending, generally cylindrical duct depending within said casing from the level of said impeller means and dividing the space within said casing into an inner air up-take chamber extending from said impeller means to a lower level spaced from the lower end of said casing and an outer annular down-take chamber for dirty air to convey air from said inlet opening downwardly within said outer down-take chamber about the periphery of said duct and into said bottom section and thence upwardly through said up-take chamber and said impeller means, said duct terminating at its lower end in a transverse, perforated, horizontal planar wall forming a dust separating baffle extending entirely across said duct, and air-driven rotary scraper means pivotally supported in depending relation from said perforated wall having blade members to be rotatably driven by the air stream within said casing and upwardly projecting scraper members carried by said blade members extending into scraping relation with the lower surface of said perforated wall.

3. Suction cleaner apparatus comprising a casing having a separable bottom section forming a receptacle for collecting dirt and like foreign matter from dirty air drawn into the casing, said casing having an air inlet opening and an exhaust opening spaced vertically from each other and spaced above said bottom section, motor-driven impeller means within said casing for drawing air through said inlet opening and discharging the same through said exhaust opening, a vertically extending, generally cylindrical duct depending within said casing from the level of said impeller means and dividing the space within said casing into an inner air up-take chamber extending from said impeller means to a lower level spaced from the lower end of said casing and an outer annular down-take chamber for dirty air to convey air from said inlet opening downwardly within said outer down-take chamber about the periphery of said duct and into said bottom section and thence upwardly through said up-take chamber and said impeller means, said duct terminating at its lower end in a transverse, perforated, disc-like planar wall forming a dust separating baffle extending horizontally entirely across said duct, shaft means depending from the center of said perforated wall, a pair of blade members centrally pivoted for rotation on said depending shaft means below said perforated wall having appropriately pitched end portions disposed in the path of air flow downwardly through said down-take chamber to be rotated by air flow, and scraper members supported on said blade members adjacent said shaft means and projecting upwardly therefrom into contact with said perforated wall to scrape the downwardly facing surface thereof over the entire area of said wall.

References Cited in the file of this patent

UNITED STATES PATENTS

1,134,294	Supanz	Apr. 6, 1915
2,049,603	Dietenberger	Aug. 4, 1936
2,143,144	Fagerberg	Jan. 10, 1939
2,594,456	Kroenlein	Apr. 29, 1952
2,639,780	Hardy	May 26, 1953

FOREIGN PATENTS

254,781	Switzerland	of 1948
---------	-------------	---------