

[54] **VACUUM CLEANER FILTER ASSEMBLY**

[72] Inventors: **William A. Batson, Pickens; Charles T. Fromknecht, Anderson, both of S.C.**

[73] Assignee: **The Singer Company, New York, N.Y.**

[22] Filed: **Mar. 20, 1970**

[21] Appl. No.: **21,331**

[52] U.S. Cl. **55/372, 15/327 E, 55/472, 55/482, 55/500, 55/507, 55/511**

[51] Int. Cl. **B01d 46/00**

[58] Field of Search **55/361-382, 467, 55/470-472, 482, 500, 507, 511; 15/327**

[56] **References Cited**

UNITED STATES PATENTS

2,503,918	4/1950	Osborn et al.	55/372
2,693,246	11/1954	Marcheck	55/492
2,774,443	12/1956	Slayter	55/379
3,040,501	6/1962	Pietsch	55/385
3,246,359	4/1966	Griffiths	15/327 R
3,273,327	9/1966	Hoffman	55/511
3,277,635	10/1966	Esmeijer et al.	55/378
3,375,541	4/1968	Fromknecht	55/376
2,447,500	8/1948	French	55/373

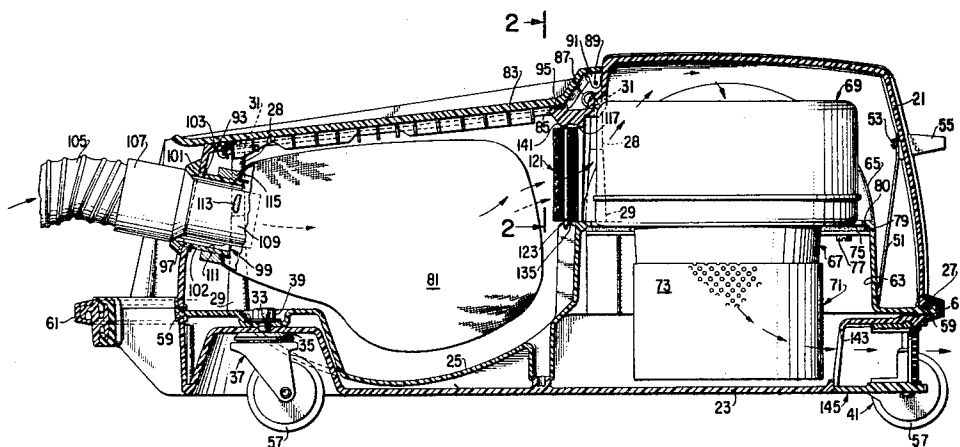
Primary Examiner—Bernard Nozick

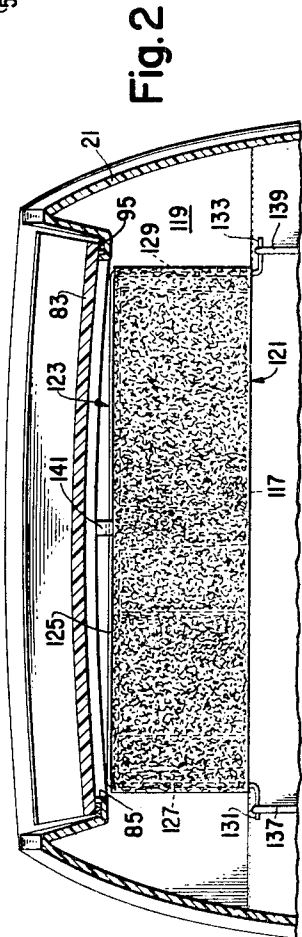
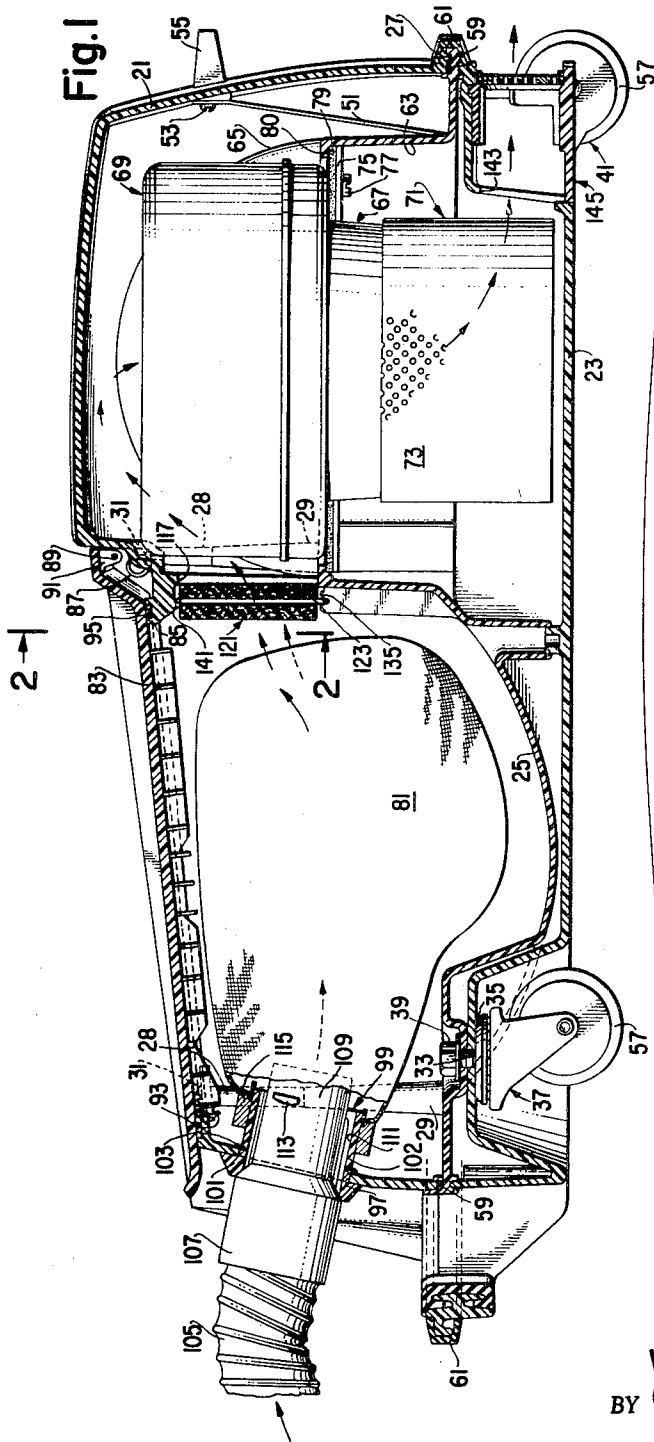
Attorney—Marshall J. Breen and Chester A. Williams, Jr.

[57] **ABSTRACT**

A vacuum cleaner of the canister variety for domestic use having upper and lower housings sandwiching an intermediate housing therebetween. An air inlet is formed at the front of the upper housing and an exhaust housing is secured to the rear of the lower housing. A dust bag is positioned between the upper and intermediate housing and is separated from a motor blower assembly by an apertured partition wall. A washable permanent secondary filter, fitted about a wire form frame, is positioned on the dust bag side of the aperture in the partition wall by means of a pair of slotted ribs which receive a portion of the wire frame and a cam-shaped rib which also holds a portion of the wire frame. The exhaust housing includes a sliding door having spaced air slots and a rear wall having similar spaced air slots alternately offset from those of the door. A hose assembly blower connection aperture is formed in the exhaust housing adjacent to the slotted rear wall. During vacuum operation the sliding door is positioned in front of the hose assembly blower aperture and air is exhausted from the motor blower assembly through both sets of slots, but during blower operation the door is positioned in front of the rear wall with the solid portion of the door closing off the slots in the wall of the exhaust housing to concentrate all the exhaust air through the hose assembly blower connection aperture.

1 Claims, 2 Drawing Figures





WITNESS:
Heidi Stucky-Rassern

INVENTORS
William A. Batson
 BY **Charles T. Fromknecht**

Marshall J. Breen
 ATTORNEY

VACUUM CLEANER FILTER ASSEMBLY

BACKGROUND OF THE INVENTION

This invention relates to vacuum cleaners and more particularly to an improved canister type of vacuum cleaner having a permanent secondary filter disposed between the primary filter bag and the motor blower assembly which may be easily removed from its mounting to be cleaned.

Canister-type vacuum cleaners usually utilize a primary filter of the disposable dust bag type for collection of the dust and dirt from the dirt laden airstream, and one or more secondary filters which back up the primary filter to protect the motor blower unit. It is known in the prior art to use a permanent type of secondary filter made of a plastic foam material which can be removed from the cleaner to be washed. However, the construction and mounting of the secondary filter in these prior art cleaners is such that in some cases the filter is destroyed during removal because of the difficult nature of removing them from the cleaner, while in other cases the remounting of the secondary filter entails a tedious procedure. Certain other prior art filters are permanently mounted on a frame which then must be soaked during washing along with the filter, in this case the filter cannot be squeezed dry and is required to dry for a long period of time thus making the cleaner inoperable during this period.

SUMMARY OF THE INVENTION

The present invention overcomes these deficiencies of the prior art by providing a secondary filter which is removably fitted about a wire frame having portions thereof which slip into slots formed on a wall of the cleaner and is locked in place by a camming tooth formed on the same wall. To remove the filter for washing, the frame is easily removed from the cleaner and the filter is slipped off the frame.

More particularly, the filter comprises a strip of open pore plastic foam material folded into the shape of a loop or pocket and having the ends of the strip permanently joined so that the filter is a continuous strip. The wire frame is a substantially U-shaped spring which is slipped within the loop or pocket formed by the filter such that the upstanding legs hold the filter substantially taut. The free ends of each leg set in a respective slot formed in a rib molded to a partition wall between the filter bag compartment and the motor blower compartment, and a camming tooth formed on the partition wall receives the central leg of the frame to secure the filter in place.

Accordingly, it is a primary object of this invention to provide in a vacuum cleaner a novel and improved construction of a secondary filter and support therefor which may easily be inserted into and removed from the cleaner.

Another object is to provide in a vacuum cleaner a permanent secondary filter which may easily be removed from its support for cleaning or washing and which may then easily be replaced upon its support and inserted into the cleaner in its proper position.

A still further object of this invention is to provide a permanent secondary filter between the primary filter bag and the motor in a vacuum cleaner which comprises a continuous loop of filter material slipped about and supported by a spring wire frame which can be easily and rapidly located and removably installed within the cleaner.

BRIEF DESCRIPTION OF THE DRAWINGS

The particular features and advantages of the invention, as well as other objects, will become apparent from the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is a vertical sectional view substantially along the longitudinal centerline of a vacuum cleaner embodying the present invention; and

FIG. 2 is a fragmentary cross-sectional view taken substantially along line 2—2 of FIG. 1.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring now to the accompanying drawings wherein like reference numerals denote similar parts throughout the several views, there is disclosed a canister vacuum cleaner comprising a frame having an upper housing 21, a lower housing 23, and a bulkhead or intermediate housing 25 trapped by the upper and lower housings in sandwichlike relationship therebetween. The three housings are fitted together at their periphery by conventional means comprising a series of tongue and groove connections generally designated 27. To secure the upper housing 21 to the bulkhead 25 there are provided on the upper housing four downwardly extending integrally molded cylindrical bosses 28 (only two of which are illustrated) which register with four similar upwardly extending threaded bosses 29 on the bulkhead (only two of which are illustrated). A screw 31 passes through each boss 27 and is threadedly received within each boss 29. A threaded stud 33 fixed to caster 35 of a front wheel assembly 37 passes through the lower housing 23 at the front thereof and is threadedly received by a nut 39 bearing on the upper face of the bulkhead to secure the lower housing to the bulkhead at the front thereof. At the rear of the cleaner a pair of fixed axis wheel assemblies 41 are each secured to the lower housing 23 by a pair of screws (not shown,) one of which passes in succession through a bracket of the assembly 41, a hole (not shown) formed in the rear of the lower housing and a boss (not shown) formed in the bulkhead, and is threadedly received in a lug (not shown) formed in a substantially V-shaped support bracket 51 secured to the upper housing 21 by a pair of screws 53 (only one of which is illustrated) that pass through holes in the upper housing and thread into a plastic molded tab 55. This arrangement, which is described in further detail in copending U.S. application Ser. No. 21,334 of the present inventors and assigned to the present assignee, secures the lower housing to the bulkhead by the elements that secure the wheel assemblies to the cleaner. The wheel assemblies 37 and 41 include wheels 57 each of which comprise a molded plastic wheel covered with an extended plastic soft surface thread which allow manipulation of the cleaner in the conventional manner. Moreover, the rear wheel assemblies 41 and the tab 55 facilitate storage of the cleaner in an endwise position and allow the cleaner to be stood upon its rear end when cleaning areas such as steps. A seal 59 provides sealing between the upper housing and the bulkhead at their outer periphery, while a conventional bumper 61 surrounds the complete cleaner to provide additional sealing, as well as the usual protection against damaging furniture.

The bulkhead 25 is formed at the rear thereof with a pair of molded pockets 63 and 65 within which are respectively mounted a motor blower assembly 67 and an electric cord reel assembly (not shown,) both of which may be of any suitable standard construction. The air moving or motor blower assembly 67 preferably comprises a two stage fan unit 69 and a coaxial driving motor unit 71, the motor being cooled by the high airflow created by the fans. Suffice it to say that in the present preferred embodiment the airflow enters an inlet opening (not shown) in the front (top) of the fan unit casing and is exhausted at the motor end through a cylindrically shaped motor blower guard 73 that is formed with exhaust apertures (only some of which are illustrated) in its cylindrical wall and is secured to the motor frame by screws (not shown). A flat circular mounting plate 75 having a large central opening is secured by screws 77 to a flange on the motor blower with a resilient seal 79 trapped therebetween, so that a portion of the seal is pressed against the motor blower flange. The pocket 63 is shaped to accept the assembled motor blower 67, mounting plate 75 and seal 79 which are then attached to a flange 80 on the pocket with a series of screws (not shown) that force the remaining unexposed areas of the seal into proper engagement with the flange 80. The mounting of the motor blower in this manner effects a minimization of vibra-

tion when the unit is in operation. A conventional push-push switch (not shown) is mounted at the front of the cleaner to activate and deactivate the motor blower.

A vacuum compartment, within which is located a porous filter bag 81, is formed by the walls of the bulkhead 25, the upper housing 21 and a plastic molded filter bag access door 83 which fitted over a recessed flanged opening 85 in the upper housing. Looped about each screw 31 and secured thereby to the upper housing is one end of a wire formed spring 87 having a single coil. The other end of each spring 87 is bent to form an axle, each of which fit within a hole 89 formed in a pair of tabs 91 (only one of which is illustrated) extending downwardly from the rear of door 83 to hingedly mount the same relative to the upper housing. At the front of the door 83 is secured a spring bracket cam latch 93 which may be cammed under a lip on the front flange of the opening 85 to lock the door in the closed position. A seal 95 secured, such as by glue, about the periphery of the opening 85 on the upper housing, ensures a substantially sealed relation between the door and the housing when the door is shut and the latch is engaged.

formed in the front wall of the upper housing is a central opening 97 within which is inserted an intake connector 99 having a flange portion 101 and a cylindrical extension 102. The connector 99 is secured in the upper housing by means of its front flanged portion 101 and an annular retaining ring 103 which together lock the connector axially to the upper housing. The connector, furthermore, includes outwardly extending lugs (not shown) which register in notches (not shown) in the upper housing opening to prevent rotational movement about the connector axis. A hose 105 fitted with a coupling 107 having an adapter 109 at its other end is connected into a frontal opening 111 of the connector 99. The adapter 109 includes a pair of lugs 113 (only one of which is shown) equally spaced about the periphery thereof which register with a similarly shaped pair of notches formed in the frontal opening 111 and the cylindrical extension 102, and which lock the hose in the inlet when the adapter is given a slight clockwise twist. The disposable filter bag 81 includes a cardboard mounting collar which slips onto the cylindrical extension 102 of the connector 99 and is held thereon by friction so that the dust and dirt in the inlet airstream passing through the hose 105 remains in the bag as the air is drawn through the vacuum or filter bag compartment by the motor blower assembly.

Mounted in the filter bag or vacuum compartment of the cleaner in front of a pair of openings 117 formed in a partition wall 119 which separates the vacuum compartment from the motor blower compartment is a washable, permanent, secondary filter 121. This filter comprises a continuous strip of open pore plastic foam folded into the shape of a loop or pocket and provides additional cleaning of the air after it has been drawn through the filter bag 81 and also serves as a protective backup filter should the filter bag rupture. The filter is formed by heat welding or stapling the ends of a strip of resilient plastic foam material to form a continuous loop, pocket or receptacle. The filter is then slipped over and about a substantially U-shaped spring metal wire form frame 123 having its central leg 125 substantially of the same length as one half the length of the entire strip of filter material so as to hold the filter form substantially taut. The two upstanding legs 127 and 129 of the frame 123 abut with the inner surface of the filter and act to support the filter and aid the central leg in holding the filter form substantially taut. At the free end of each leg

127 and 129, the frame is bent to form a respective axle portion 131 and 132, each of which sets in a slot 135 (only one is illustrated) formed in a respective upwardly extending rib 137 and 139 molded in the bulkhead 25. Extending downwardly from the upper housing 21 above the filter in substantially the same plane as the ribs 137 and 139 of the bulkhead, is an integrally molded camming tooth 141. The filter is inserted into the cleaner by placing the axles 131 and 133 in their respective slots in the ribs 137 and 139 and then pivoted upwardly until the leg 125 snaps under the tooth 141 and is locked thereby between the tooth 141 and the wall 119 with the filter in a sealed relation with the wall 119 so that the airflow in the vacuum compartment must flow therethrough. To remove the filter 121 for cleaning or washing, the leg 125 is released from tooth 141, the axles 131 and 133 are removed from their respective slots, and the filter strip is removed from the wire frame.

It should now be clear that during operation of the cleaner dirt-laden air enters the cleaner through the hose 105 and passes through the bag 81 and thence through the filter 121 into the inlet of the fan and is exhausted at the motor end of the motor blower unit through the blower guard 73. The exhaust air then passes through outlet apertures 143 formed in the rear of the lower housing 23 and is exhausted therefrom through an exhaust diffuser housing 145 which is described in detail in the aforesaid copending commonly assigned U.S. application.

Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However, it is to be understood that the present disclosure relates to a preferred embodiment of my invention which is for purposes of illustration only and not to be construed as a limitation of the invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claim.

Having thus set forth the nature of this invention, what we claim herein is:

1. In a vacuum cleaner comprising a housing having a suction compartment within which is mounted an air-permeable filter bag, an air-moving unit compartment separated from said suction compartment by a partition wall having an opening therein, means defining an air inlet in said housing communicating with said filter bag, means defining an outlet in said housing communicating with said air-moving unit compartment, and an air-moving unit mounted in said air-moving unit compartment for drawing dirt-laden air through said inlet and discharging filtered air through said outlet, the improvement comprising: a secondary filter having a continuous strip of permanent-type filter material closed upon itself in the form of a loop, a substantially U-shaped spring wire frame fitted within said loop, the length of the central leg of said frame being substantially equal to one half the peripheral length of said filter strip, each upstanding leg being in abutting relation with the inner surface of the filter loop, an axle formed at the free end of each upstanding leg, a pair of ribs formed on the suction compartment side of the partition wall adjacent said opening, each said rib having a slot receiving one of said axles, and a camming tooth formed on said wall adjacent said opening in substantially the same plane as said ribs cooperating with the central leg to releasably lock said central leg between said tooth and said partition wall whereby said frame is removably mounted with said secondary filter superposed over said opening in the partition wall.

* * * * *