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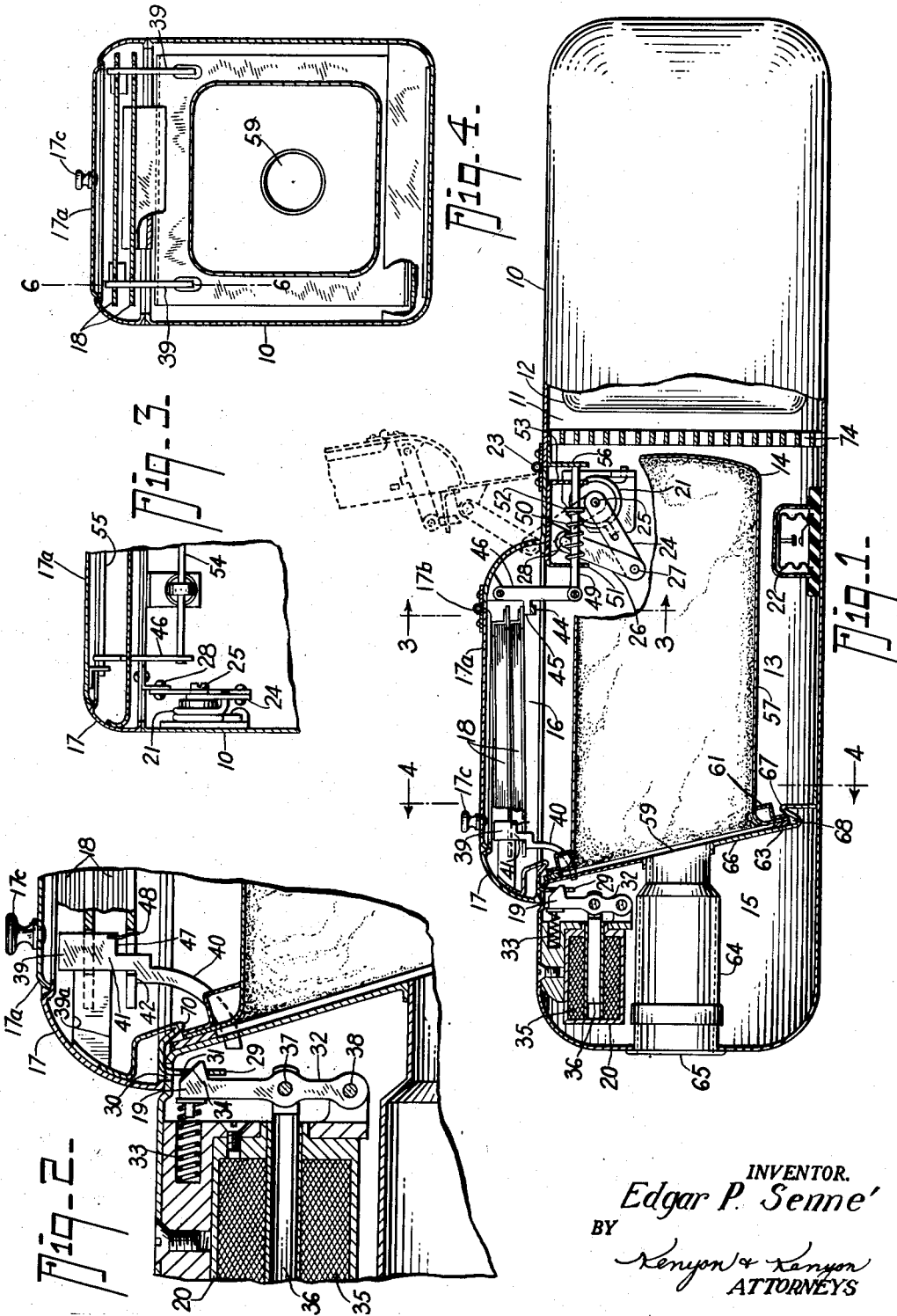
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2,646,855

FILTER REPLACEMENT MECHANISM FOR VACUUM CLEANERS

Filed Nov. 25, 1950

2 Sheets-Sheet 1



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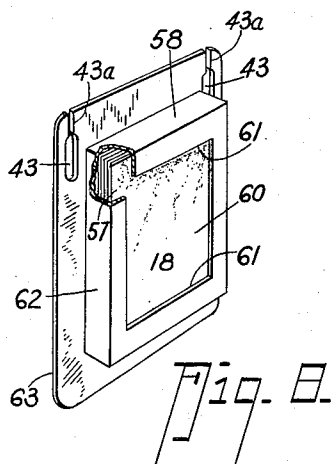
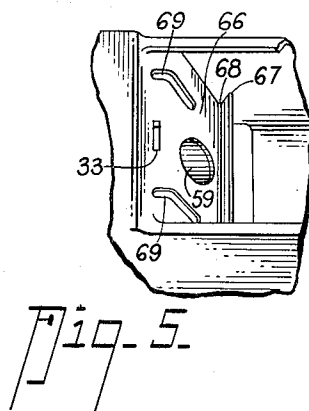
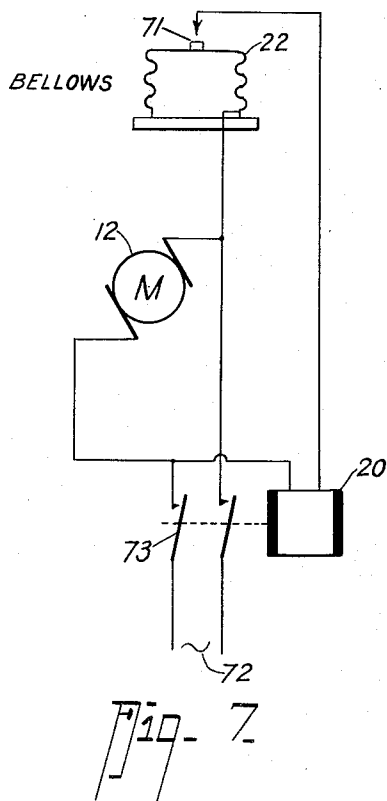
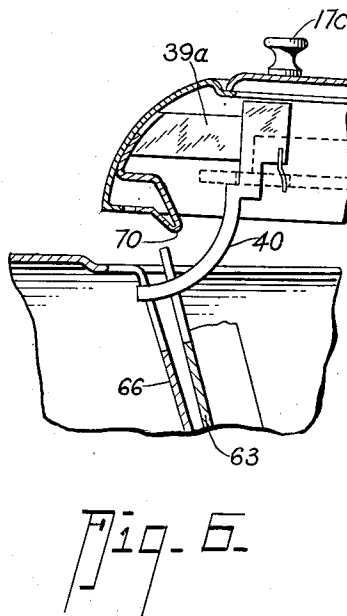
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FILTER REPLACEMENT MECHANISM FOR VACUUM CLEANERS

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2 Sheets-Sheet 2



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FILTER REPLACEMENT MECHANISM FOR
VACUUM CLEANERS

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Application November 25, 1950, Serial No. 197,565

20 Claims. (Cl. 183—37)

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This invention relates to vacuum cleaners of the type having a magazine of reserve fresh filter bag units and mechanisms for the serial transfer of such units to an operating position in the cleaner as the preceding unit becomes filled with dirt by the normal cleaning action of the cleaner and requires replacement. Such cleaners are disclosed and claimed broadly in my copending application Ser. No. 719,060, filed December 28, 1946, now U. S. Patent No. 2,532,642, issued December 5, 1950.

It is a general object of the present invention to provide vacuum cleaner constructions of the foregoing general character which are structurally and operationally simplified, for example, to the point where they are economically and otherwise particularly suited for the inexpensive domestic vacuum market. To that end, it contemplates particularly the provision of mechanisms which open the vacuum cleaner, either manually or automatically, for the removal of a filter bag unit which has been used by having been filled with dirt by the normal operation of the cleaner, and mechanisms which, in response to a reclosing of the cleaner by the operator, automatically transfer a fresh unit from the magazine to an operating position in the cleaner for filtering of air therethrough in the normal manner. While for purposes of simplicity, it is contemplated especially that the step of removing the used filled filter bag and the step of closing the cleaner both be accomplished manually, it will be understood that the mechanisms of the invention may find usefulness in other types of cleaners, for example in more complex types wherein all operations are automatic including the step of removing or ejecting the used filled filter from the cleaner and the step of closing the cleaner.

It is a further object of the invention to provide for the filter bag unit itself a novel construction particularly adaptable to use in vacuum cleaners of the general type herein described.

The full nature of the invention together with further objects and advantages thereof will best be understood from the illustrative embodiment hereinafter described with reference to the accompanying drawings in which:

Fig. 1 is a side view, partly in cross section and partly in elevation, of a vacuum cleaner embodying the invention;

Fig. 2 is a cross sectional enlargement of a portion of Fig. 1 showing particularly the details of the mechanisms which hold the vacuum cleaner closed and the filter bag unit firmly in position during normal operation of the machine for air filtering purposes;

Figs. 3 and 4 are transverse cross sections of the Fig. 1 along the lines 3—3 and 4—4 respectively, the Fig. 3 being only a partial cross section;

Fig. 5 is a perspective view of a portion of the Fig. 1;

Fig. 6 is a cross sectional view of a portion of the Fig. 1 taken as though along the line 6—6 of Fig. 4 and illustrating in detail the action during the closing movement;

Fig. 7 illustrates schematically an electrical circuit employed in the embodiment of Fig. 1;

While the Fig. 8 illustrates, in perspective view, a cartridge-like filter bag unit employed in the embodiment of the Fig. 1.

Referring particularly to the Fig. 1, the vacuum cleaner there illustrated may be viewed as comprising generally a chassis or "tank" type housing 10 within which are enclosed the various operating elements of the vacuum cleaner. For discussion, the housing may be considered as divided into sections including an air propulsion compartment 11 having therein a conventional fan and motor unit 12; an air filtering compartment 13 within which there are provided mechanisms for holding a filter bag unit 14 in the position shown for the normal filtering operation of the cleaner; an intake manifold section 15 having mechanisms for directing air into the filter unit during such operation; a hatch or magazine section 16 in the form of an upwardly rotatable casing 17 which contains magazine mechanisms for storing a plurality of reserve fresh filter units 18 and automatically transferring the lowermost thereof to the operating position of the filter bag unit 14 in response to each closing movement of the casing 17, i. e., as the casing 17 is moved from the open position illustrated by the dotted lines in the Fig. 1 to its full line position illustrated in Fig. 1.

Also provided is a releasable latch mechanism 19 (actuatable by an electromagnet 20) for holding the casing 17 in its closed (full line) position and permitting it to move to its open (dotted line) position under the action of a suitable means such as biasing spring 21 when the filter bag unit 14 in the operating position has become filled with dirt to a predetermined degree and requires replacement. Although it may be actuated by suitable manually operable means (not shown), the latch mechanism 19 is intended to be actuated by some sort of an automatic mechanism such as a bellows 22 which by energizing electromagnet 20 when the filter bag unit 14 becomes filled to a predetermined degree causes latch mechanism 19 to release casing 17 for movement to its upward position. The bellows 22 is operated by changes

in the air pressure conditions within the filter compartment 13 resulting from a filling of the filter unit 14 with dirt, and is so arranged as to close a circuit (Fig. 7) controlling the electromagnet 20 when pressure in the filtering compartment corresponds to that of a filled filter unit. Alternatively, instead of the bellows 22 there may be used means responsive to the thermal effects of the filling of unit 14 such as are disclosed in my copending application Serial No. 27,278, filed May 15, 1948, entitled Vacuum Cleaner Mechanisms Responsive to Thermal Effects of Filter Bag Filling.

It is contemplated further that the filled bag unit 14 in this particular embodiment will be removed manually after the casing 17 has automatically moved to its open (dotted line) position and that, as the operator manually moves the casing 17 back to its closed position, the mechanisms therein will automatically release the lowermost of the reserve fresh filter units 18 and permit it to drop in a swinging motion about its leftward end (as seen in Fig. 1) downward into the position occupied previously by the removed filter bag unit 14.

The details of the casing 17 and its internal mechanisms are as follows: The casing 17 is hinged to the housing 10 by a hinge mechanism 23 extending transversely of the housing so that it may rotate between the open and closed positions shown respectively in the dotted and full lines in the Fig. 1. Although it may be opened by any suitable lifting mechanism, the casing is shown as normally biased to the open or dotted line position by suitable spring means illustrated by the coiled spiral spring 21 having one end affixed to the housing 10 and the other to a radius arm 24 journaled on a stud 25 affixed to the housing. The radius arm 24 is connected to the casing 17 by a link member 26 journaled at one end to radius arm 24 at 27 and to the casing 17 at its other end at 28. It will be understood that if the spring 21 is normally under compression, it will normally tend to rotate the casing 17 to the open position unless this rotation is restrained by suitable releasable restraining means.

As part of a suitable restraining means of this nature there is affixed to the forward end of the casing 17 a tongue 29 which, in the closed position of the casing projects through a hole 30 in the wall of the housing 10. The lower end of the tongue 29 is provided with a hole 31 by which the tongue may be engaged by the restraining latch bolt 32 of latch mechanism 19, latch bolt 32 being normally biased to engage and restrain tongue 29 by biasing spring 33 which forces the latch bolt to the right as seen in the Figs. 1 and 2. It will be apparent that the upper surface of the latch bolt is so shaped with inclined surface 34 that as the casing 17 is moved downwardly, the latch bolt will move slightly to the left against the force of spring 33 and then rightward to complete engagement in the hole 31 of the tongue.

For withdrawing the latch bolt from this hole 31 at the proper time, any suitable construction may be employed, for example, the electromagnet shown as including the coil 35 and the armature 36, the armature being attached to the latch bolt 32 at a journal 37, and the latch bolt being fixedly journaled at 38 so that its upper end may rotate leftward and rightward as seen in the Figs. 1 and 2.

In order better to understand the operation of the magazine-like casing 17 and the filter unit replacement mechanisms contained therein, it is

well first to note the construction of a cartridge-like filter bag unit 18. This is best visualized by reference to the perspective view of the Fig. 8. The unit preferably comprises a prefolded filter bag 57 retained within and by a retainer framework 58 in such manner that while the prefolded bag cannot be dislodged accidentally from the retainer framework by the jarring experienced during normal handling prior to actual use, nevertheless, upon replacement of the opening of the bag 57 against the manifold outlet opening 59 through which the air to be filtered enters the filter compartment 13, the air flow directed into the folded bag when motor fan unit 12 is in operation will cause it to be forced out of the opening 60 of the retainer framework 58 into an expanded operating position such as indicated for the unit 14 in the Fig. 1. The rim 61 projecting inwardly from side walls 62 of framework 58 permits this functioning since rim 61 furnishes only enough resistance to movement of bag 57 out of opening 60 to prevent dislodgment of the bag during normal handling prior to use but not enough resistance to prevent dislodgment by the pressure of air flowing through the cleaner in normal operation. It is understood that the portions of bag 57 about its mouth are affixed to retainer framework 58 or to rim 63 so that either the framework or the rim will hold the bag in position during normal operation as indicated for unit 14 in Fig. 1; and, further that the bag 57 may have, in any event, a suitable inlet opening in the face of unit 18 concealed from view in Fig. 8, the positioning being such that the opening will align with outlet opening 59 of the intake manifold when a filter unit assumes the Fig. 1 position. The retainer framework 58 with the pre-folded filter bag therein may be considered as a pre-packaged cartridge unit such as is disclosed and claimed broadly in my copending application Ser. No. 27,277, filed May 15, 1948, now Patent 2,543,556, dated Feb. 27, 1951, and entitled Cartridge-like Filter Units for Vacuum Cleaners.

As a support and guiding means for the cartridge-like unit within the machine of the present invention, there may be provided the ridge or rim 63 extending around the outside edges of the retainer framework 58 and rigidly affixed thereto. This rim 63 is provided with elongated guide holes or slots 43 in opposite sides and of such dimensions that the hook-like filter unit guiding members 39 may extend therethrough and guide the movement of the units as later explained. The elongated dimension of the slots 43 will thus be roughly such that it is just slightly larger than the longitudinal dimension of the cross section of the upper portion 41 of the hook-like members 39 as will be apparent from the description of the function of the hook-like members 39 presently to be made. Similarly, the transverse dimension of the slots 43 is just enough to accommodate the width of both upper portions 41 and lower portions 40 of members 39. The function of the auxiliary slots 43A will be explained later.

It is to be understood that the retainer framework 58 may be omitted in which case the filter unit may comprise only a folded bag having its mouth suitably affixed peripherally to the rim 63 which may take any form defining a closed outline or frame with a central opening for alignment with the mouth of the bag.

The mechanism whereby a reserve filter unit 18 is released from the magazine in the casing 17 whenever the operator closes the casing, is

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as follows: Affixed to the front wall of the casing 17 by rod like supports 39A are two hook line filter unit guiding members 39 each of which has its lower half portion 40 of circular cross section offset from its upper half portion 41 of generally rectangular or elongated oval cross section to form a shoulder 42. These hook-like members are arranged to be received within the two guide slots 43 in a cartridge-like filter unit 18 (better seen in Fig. 8). As will be visualized from the Figs. 1 and 2, a plurality of these units illustrated in Fig. 8 may be stacked upon the hook-like members 39 in such manner that the leftward end of the rim 63 of the lowermost unit rests on the shoulders 42. The opposite end of the rim 63 of the lowermost unit may rest on a suitable shelf-like member 44 which may take the form of a bar affixed to and extending laterally across the casing 17. The arrangement is such that a releasing or triggering force exerted on the right-hand end of the lowermost filter unit will permit its guide slots 43 to move to the left to the point where they will align with the lower portions 40 of the hook-like members 39 so that the left-hand end (as seen in Figs. 1 and 2) of the lower-most filter unit may drop off shoulders 42 and slide down members 39 with the guide slots 43 around the lower hook-like portions 40 of the hook-like members 39. To this end, the transverse dimension of the guide slots 43 is slightly larger than the diameter of the cross section of portions 40. Such a releasing force is supplied by the projections 45 on the arms 46 of the releasing or triggering mechanism hereinafter to be described. In order to insure that the upper filter units will not also slide down the hook-like members in this fashion until they in turn have become lowermost in the stack and been pushed by the projection 45, the upper portions 41 of hook-like members 39 are constructed so as to have a cross section substantially the same as or just slightly smaller than the cross section of the guide slots 43 in the filter unit. Thereby the upper filter units in the stack may not be pushed to the left as is the case with the lowermost; it is not until any one unit becomes the lowermost by dropping below the shoulder 47 that it is possible for it to be pushed to the left. It is understood that that portion of members 39 between shoulders 42 and 47 has a circular cross section small enough to allow the described movement of the lowermost unit 18. In order to prevent dropping of the lowermost member 18 other than by action of projection 45, as for example by gravity if the machine is placed in a position other than that shown, a spring 48 may be provided to hold the lowermost filter unit in its extreme right-hand position with rim 63 on shoulder 42 until sufficient force is exerted by the arm 46 to overcome the spring.

The auxiliary slots 43A (Fig. 8) are of narrower transverse dimension than slots 43 and in effect constitute a narrowed extension of slots 43 to the edge of rim 63 in the longitudinal direction of slots 43. The purpose of auxiliary slots 43A is to permit the rim 63 to pass by supports 39A for members 39, i. e., as the units 18 drop or slide downward along the upper portions of members 39, the side walls of slots 43A will pass around supports 39A so that supports 39A do not interfere with the dropping of the units 18. At the same time slots 43A are narrow enough that lower portions 40 of members 39 cannot pass through them; therefore, the rim

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63 and its attached bag can still hang from the hook-like lower portions 40 by means of the shoulders forming an entrance to slots 43A without the units dropping off portions 40. It is understood that all this necessarily means that supports 39A have a transverse dimension less than that of either portions 40 or 41 or slots 43.

It will be understood that slots 43A may extend laterally of slots 43 or in any other direction if, for example, the supports 39A should be affixed to the sides of casing 17 rather than at the front as shown in the drawings. Furthermore, if the members 39 should be supported by being affixed to the top wall of casing 17 rather than by the use of supports 39A, then the slots 43A may be used rather as a way of introducing members 39 into slots 43, in which case portions of rim 63 may be flexible enough to permit bending of the side walls of slots 43A around member 39.

A plurality of units 18 may be stacked in casing 17 in any convenient manner, as by opening a hatch door 17A hinged at 17B, and fitting the slots 43 around the top end of members 39. Door 17A may be constructed to open up the major portion of the upper wall of casing 17 and may be provided with a suitable lifting knob 17C. Alternatively, a stack of units 18 may be placed in casing 17 by fitting slots 43 over the bottom end of members 39 when casing 17 is in its open (dotted line) position.

For the further mechanism for actuating the arm 46 to move the lowermost filter unit, it will be seen that there is provided on the lower surface of the casing 17 a reciprocable rod 49 normally biased to the right by a spring 50 which engages the fixed depending rib or ridge 51 on the lower wall of the casing 17 and a suitable collar 52 affixed to the rod 49. The rightward end of the rod 49 may slide through a hole in another rib 53 depending from the casing 17. It will be clear therefore that the rod 49 slides leftward and rightward in ribs 51 and 53 although it is normally biased to the right by the spring 50. The leftward end of the rod 49 is journaled on cross rod 54 (Fig. 3) which interconnects the lower ends of the arms 46 (one on each side of casing 17), the upper ends of the arms 46 being journaled on an axle 51 suitably affixed to casing 17.

It will be apparent that as the casing 17 is rotated toward its open position, there will come a prearranged point in the rotation at which the spring 50 will move the arms 46 and the rod 49 sufficiently to the right (viewing the full line position of Fig. 1), to withdraw the projections 45 sufficiently to permit the lowermost filter unit to fall to a position on shelf member 44 where it may be engaged by the projections 45 on their next leftward movement. Then, as the casing 17 is moved back to its closed position, the right end of rod 49 will engage a fixed rib 56 on the housing 10 which will thereby cause the rod, by virtue of rotation of the casing 17, to move leftward thereby moving the arm 46 leftward and causing projections 45 to push the lowermost filter unit to the left. By suitable dimensioning of the various parts, engagement between rib 56 and rod 49 may be arranged to occur at a suitable angular position of casing 17 during its closing movement such that the lowermost filter unit 18 will be released and swing on portions 40 of members 39 about its lefthand end until its righthand end engages wall 66 as later described.

The intake manifold section 15 may comprise any suitable means for permitting air to be filtered to reach the filtering compartment. For example, a tube 64 may be provided having an inlet end 65 in the external surface of the housing 10 and adapted to receive the end of a flexible hose of the conventional type, the hose not being shown. The tube 65 will have an outlet opening 59 in sloping wall 66, the opening 59 being arranged to align with the inlet orifice of the filter bag as previously explained.

The manner in which a fresh filter unit is placed in and locked in operating position after it has been released and dropped from the casing 17 in the manner already described, is particularly to be noted, and is in part attributable to the action of the sloping wall 66 which extends transversely across casing 10. This sloping wall, which is better visualized in perspective in Fig. 5, is provided at its lower end with an upwardly extending ridge 67 forming a trough-like receptacle 68 which is adapted to receive the lower edge of rim 63 of a filter unit and prevent its being moved in the downstream direction of the filtered air by air pressure. It will be apparent that in swinging from the members 39 as casing 17 closes, a filter unit will automatically come to the position shown in Fig. 1 in which the bottom end of the rim 63 rests within the groove or receptacle 68 formed by the ridge 67 of the sloping wall. This is by virtue of the fact that as the filter unit after release from the magazine swings downward on the curved lower portions 40 of the hook-like members 39, the lower edge of the rim 63 will come into contact with the sloping wall 66 at a time when casing 17 is at a position intermediate between its open and closed positions, and, as the casing completes its closure, this lower edge will slide downward along wall 66 into the groove formed by the ridge 67. This is somewhat indicated by the Fig. 6 in which the rim 63 is indicated in a mid-way position before it has completed its dropping into the final position of Fig. 1. The tendency of the rim 63 to swing toward the sloping wall 66 is there apparent.

The completion of the locking in position of the filter unit 18 by means of its rim 63 is indicated by the Figs. 1 and 2 and takes place in the following manner. As the lower edge of the rim 63 slides down the sloping wall 66 and into the groove 68, there will come a point when the downward motion is arrested by contact with the bottom of the groove. From thereon, further closure of the casing 17 will cause the hook-like members to move downward in the slots 43 of the filter unit rim, the hook-like members extending through the slots 69 in the sloping wall as best visualized in the Fig. 5. Thereupon, the complete closure of the casing 17 will cause the protruding ridge 70 on the casing 17 to overlap the upper edge of the rim 63 as the casing 17 comes down, thereby firmly locking the upper and the lower edges of the rim 63 as indicated in the Fig. 1.

The filter compartment also includes the bellows mechanism 22 which is of a conventional type such as disclosed in my aforementioned Patent 2,532,642. It may be any sort of mechanism responsive to change in pressure as the filter bag 14 becomes filled with dirt. Suitable means for connecting the bellows 22 and the electromagnet 20 in a circuit such that the electromagnet is energized when the filter bag becomes filled are not shown in Fig. 1 since such

means are quite conventional but they are illustrated in schematic circuit in the Fig. 7. There it will be noted that if the bellows should be decompressed and permitted to expand responsive to a diminution of pressure as the filter bag reaches a predetermined degree of filling, the contacts 71 of the bellows will be closed thereby connecting the electromagnet 20 to the power source indicated generally by the numeral 72. The electromagnet will of course open the casing 17 as previously described. At the same time, the circuit is arranged such that the energization of the electromagnet will, by opening switch 73, disconnect the main power source from the motor 12 driving the vacuum cleaner so that the machine in its entirety is stopped when the filter bag becomes filled and the operator is thereby forced to replace it and reclose switch 73 before operation can be resumed.

The lower or downstream end of the filter compartment is separated from the motor compartment by any suitable means such as the perforated wall 74.

It will thus be seen that there has been provided by this invention a relatively simple mechanism whereby the operator may automatically or semi-automatically replace a filter bag unit when the filter unit in operating position within the machine is filled to a predetermined degree. As indicated, it is preferable that the operator be forced to take such step by virtue of the fact that the casing 17 is automatically opened and the motor stopped. From thereon, the operator need only remove the filled filter bag 14 in Fig. 1 manually, and thereupon manually reclose the machine by rotating the casing 17 downward from the dotted to the full position of Fig. 1 whereupon a fresh filter unit will automatically drop to the operating position and be locked therein. Thereafter it will open by the air pressure within the machine to the expanded position shown in Fig. 1.

What is claimed is:

1. In a vacuum cleaner, a filter replacement mechanism for receiving a plurality of reserve fresh filter units and serially placing said units in operating position in said cleaner upon successive actuations of said mechanism comprising, an opening and closing member for the removal of filter units from said cleaner mounted on said cleaner for movement between closed and open positions, a storage magazine adapted to hold a plurality of fresh filter units, and means actuated by movement of said member from open to closed position for moving one of said filter units from said magazine to said operating position.

2. A mechanism as in claim 1 including means biasing said member to open position, latch means for holding said member in closed position against the biasing force of said biasing means during operation of said cleaner, and means for releasing said latch means whereby said member moves to open position for removal of a used filter unit from said operating position and for re-engaging said latch means upon closure of said member whereby the cleaner is again in operating condition with a fresh filter unit in operating position.

3. In a vacuum cleaner, a filter replacement mechanism for receiving a plurality of reserve fresh filter units and serially placing said units in operating position in said cleaner upon successive actuations of said mechanism comprising, an opening and closing member for the removal of filter units from said cleaner mounted on said

cleaner for movement between closed and open positions, a storage magazine adapted to hold a plurality of fresh filter units above said operating position, and means actuated by movement of said member from open to closed position for dropping and guiding one of said filter units from said magazine to said operating position.

4. In a vacuum cleaner, a filter replacement mechanism for receiving a plurality of reserve fresh filter units and serially placing said units in operating position in said cleaner upon successive actuations of said mechanism comprising an opening and closing member for the removal of filter units from said cleaner mounted on said cleaner for movement between closed and open positions, a storage magazine adapted to hold a plurality of fresh filter units, release means for releasing one of said fresh filter units from said magazine, means for directing the released unit to an operating position in said cleaner, and means actuated by movement of said member from open to closed position for actuating said release means.

5. In a vacuum cleaner, a filter replacement mechanism for receiving a plurality of reserve fresh filter units and serially placing said units in operating position in said cleaner upon successive actuations of said mechanism comprising, an opening and closing member for the removal of filter units from said cleaner mounted on said cleaner for movement between closed and open positions, a storage magazine adapted to stack vertically a plurality of fresh filter units, release means for releasing the lowermost of said fresh filter units from said magazine for gravitational fall therefrom, means for directing the released unit to an operating position in said cleaner as the same falls, and means actuated by movement of said member from open to closed position for actuating said release means.

6. In a vacuum cleaner, a filter replacement mechanism for receiving a plurality of reserve fresh filter units and serially placing said units in operating position in said cleaner upon successive actuations of said mechanism comprising, a casing hinged to said cleaner for upward rotation between closed and open positions and including therein a storage magazine adapted to stack vertically a plurality of fresh filter units, release means for releasing the lowermost of said fresh filter units from said magazine for gravitational fall therefrom, means for directing the released unit to an operating position in said cleaner as the same falls, and means actuated by movement of said member from open to closed position for actuating said release means.

7. A mechanism as in claim 6 in which said means for directing the released filter unit comprises a device supporting one end thereof while the other end drops in swinging motion and a sloping wall in said cleaner adapted to arrest said swinging motion and guide said other end to position as said member closes.

8. In a vacuum cleaner, a filter replacement mechanism for receiving a plurality of reserve fresh filter units and serially placing said units in operating position in said cleaner upon successive actuations of said mechanism comprising, an opening and closing member for the removal of filter units from said cleaner mounted on said cleaner for movement between closed and open positions, a storage magazine adapted to hold a plurality of fresh filter units, release means for releasing one of said fresh filter units from said magazine, means for directing the released unit

to an operating position in said cleaner, locking means for locking said released unit in said operating position and means actuated by the movement of said member from open to closed position for actuating first said release means and then said locking means.

9. In a vacuum cleaner, a filter replacement mechanism for receiving a plurality of reserve fresh filter units and serially placing said units in operating position in said cleaner upon successive actuations of said mechanism comprising, an opening and closing member for the removal of filter units from said cleaner mounted on said cleaner for movement between closed and open positions, a storage magazine within said member adapted to stack vertically a plurality of fresh filter units, release means for releasing the lowermost of said fresh filter units from said magazine for gravitational fall therefrom, means for directing the released unit to an operating position in said cleaner as the same falls, locking means for locking said released unit in said operating position and means actuated by the movement of said member from open to closed position for actuating first said release means and then said locking means.

10. In a vacuum cleaner, a filter replacement mechanism for receiving a plurality of reserve fresh filter units and serially placing said units in operating position in said cleaner upon successive actuations of said mechanism comprising, a casing hinged to said cleaner for movement between closed and open positions and including therein a storage magazine adapted to stack vertically a plurality of fresh filter units, release means for releasing the lowermost of said fresh filter units from said magazine for gravitational fall therefrom, means for directing the released unit to an operating position in said cleaner as the same falls, locking means for locking said released unit in said operating position and means actuated by the movement of said member from open to closed position for actuating first said release means and then said locking means.

11. A mechanism as in claim 10 in which said means for directing the released filter unit comprises a device supporting one end thereof while the other end drops in swinging motion and a sloping wall in said cleaner adapted to arrest said swinging motion and guide said other end to position as said member closes, said locking means comprising means at the bottom of said wall receiving and holding said other end and means on said member holding said one end of said unit when said member is in closed position.

12. A filter bag unit for use in a vacuum cleaner of the type including a magazine for such units and mechanisms for guiding said units to an operating position in the cleaner, said unit including a frame for supporting said unit while in said magazine, said frame having thereon guide means for cooperation with said guiding mechanisms, and a filter bag collapsibly affixed to said frame.

13. A unit as in claim 12 in which said frame comprises a rim and said guide means comprises at least one hole through said rim.

14. A unit as in claim 13 including a slot from the edge of said rim to said hole for the insertion of the guiding mechanisms into said hole.

15. A filter bag unit for use in a vacuum cleaner of the type including a magazine for such units and mechanisms for guiding said units to an operating position in the cleaner, said unit in-

cluding a rim defining a closed frame for supporting said unit while in said magazine and securing the hereinafter mentioned filter bag when in said operating position, said frame having thereon guide means for cooperation with said guiding mechanisms, and a filter bag having its mouth affixed to said rim so as to align with the opening defined by said frame.

16. A filter bag unit for vacuum cleaners for use in a vacuum cleaner of the type including a magazine for such units and mechanisms for guiding said units to an operating position in the cleaner, said unit comprising a collapsed filter bag, a retainer packaging and holding said collapsed bag and having an opening through which the main body of said bag may be dislodged from said retainer, means included in said unit at least partially closing said opening to prevent dislodgment of said bag from said retainer during normal handling prior to use but permitting dislodgment of the main body of said bag when said filter expands as hereinafter indicated, said retainer being so constructed and arranged that said unit is insertable bodily within a vacuum cleaner with said bag in position to filter the normal air flow therethrough, said bag being so constructed and arranged that during use said bag may be expanded by air flow through said cleaner from its collapsed condition out of said opening to the extent that the main body thereof is extended out of said retainer to form an enlarged dirt-collecting filter, and guide means on said retainer for cooperation with said guiding mechanisms.

17. In a vacuum cleaner, a filter replacement mechanism for receiving a plurality of reserve fresh filter units and serially placing said units in an operating position in said cleaner upon successive actuations of said mechanism comprising, a storage magazine adapted to stack vertically a plurality of fresh filter units, release means for releasing the lowermost of said fresh filter units from said magazine for gravitational fall therefrom, means for directing the released unit to an operating position in said cleaner as the same falls, and means for actuating said release means after removal of a previously filled filter unit from said operating position.

18. In a vacuum cleaner, a filter replacement

mechanism for receiving a plurality of reserve fresh filter units and serially placing said units in an operating position in said cleaner upon successive actuations of said mechanism comprising, a storage magazine adapted to stack vertically a plurality of fresh filter units and including vertically disposed guide rod means along which said units may slide, release means for releasing the lowermost of said fresh filter units from said magazine for gravitational fall therefrom while sliding down said guide rod means, said guide rod means including a portion for directing the released unit to an operating position in said cleaner as the same falls, and means for actuating said release means after removal of a previously filled filter unit from said operating position.

19. A mechanism as in claim 18 in which said portion of said guide rod means comprises a section adapted to cause the falling unit to rotate about one end thereof into said operating position.

20. In a vacuum cleaner, a filter replacement mechanism for receiving a plurality of reserve fresh filter units and serially placing said units in an operating position in said cleaner upon successive actuations of said mechanism comprising, a storage magazine including vertically disposed guide rod means along which a plurality of fresh filter units may be stacked and down which said units may slide by gravity, release means for releasing the lowermost of the stacked units for gravitational fall from said magazine while sliding down said guide rod means, said guide rod means including a lower section thereof adapted to cause the falling unit to rotate about one of its ends, means adjacent said lower section adapted to receive said falling unit after its rotation and position the same for normal filtering action of said cleaner, and means for actuating said release means after removal of a previously filled filter unit from said operating position.

EDGAR P. SENNE.

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