June 4, 1946. H. B. WHITE 2,401,394

SUCTION CLEANER

Filed Nov. 11, 1943 3 Sheets-Sheet 1

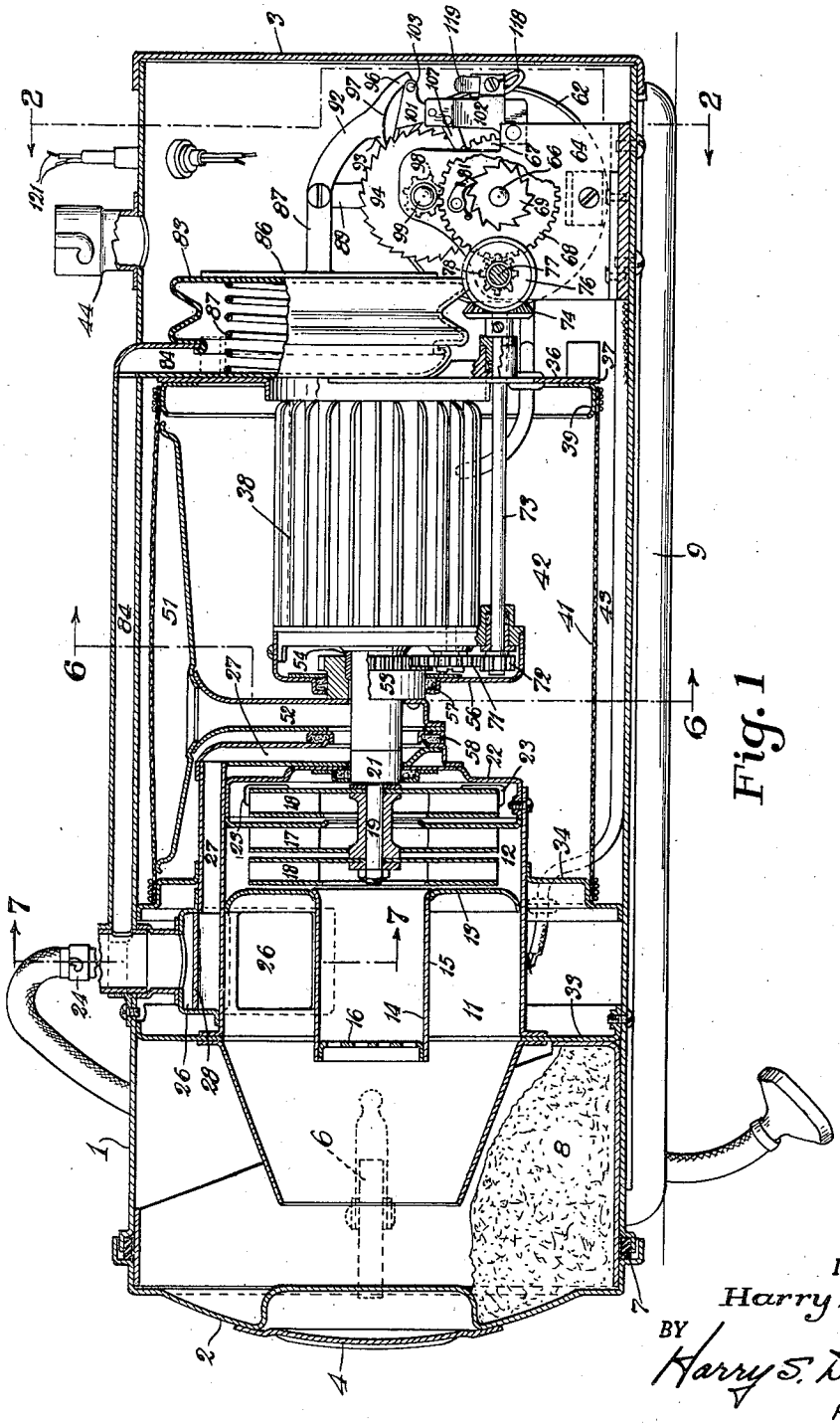


Fig. 1

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SUCTION CLEANER

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Fig. 2

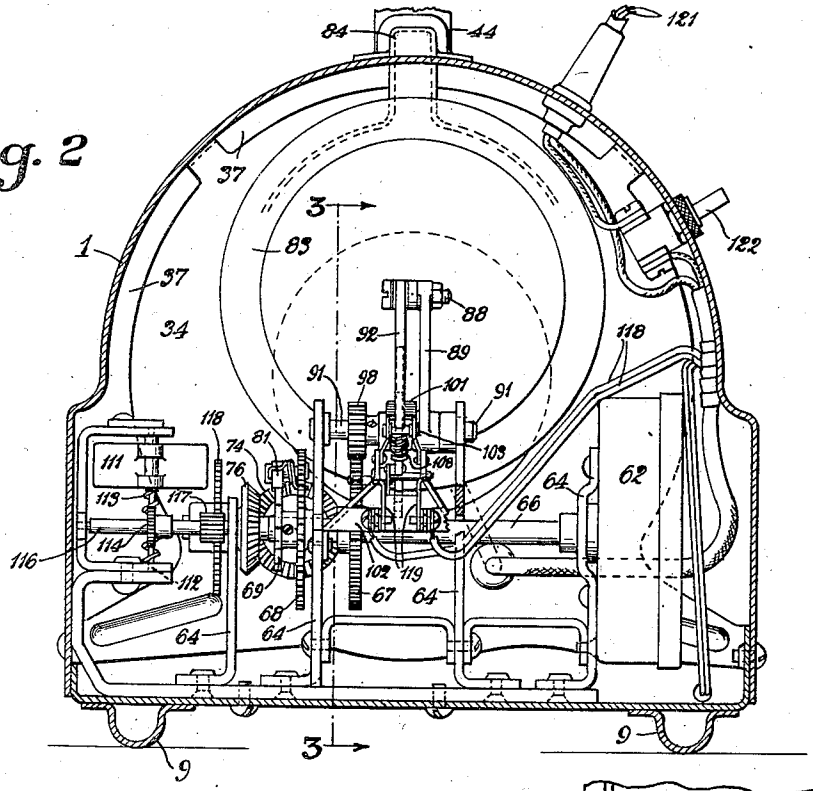
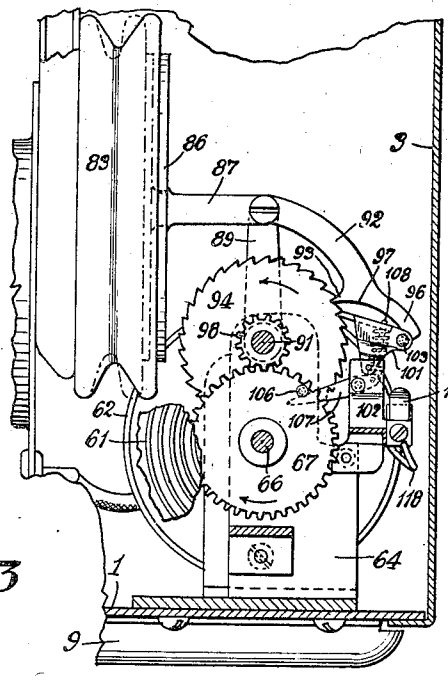


Fig. 3



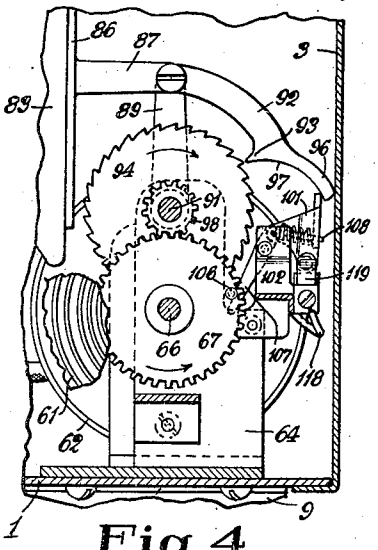


Fig. 4

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SUCTION CLEANER

Filed Nov. 11, 1943 3 Sheets-Sheet 3

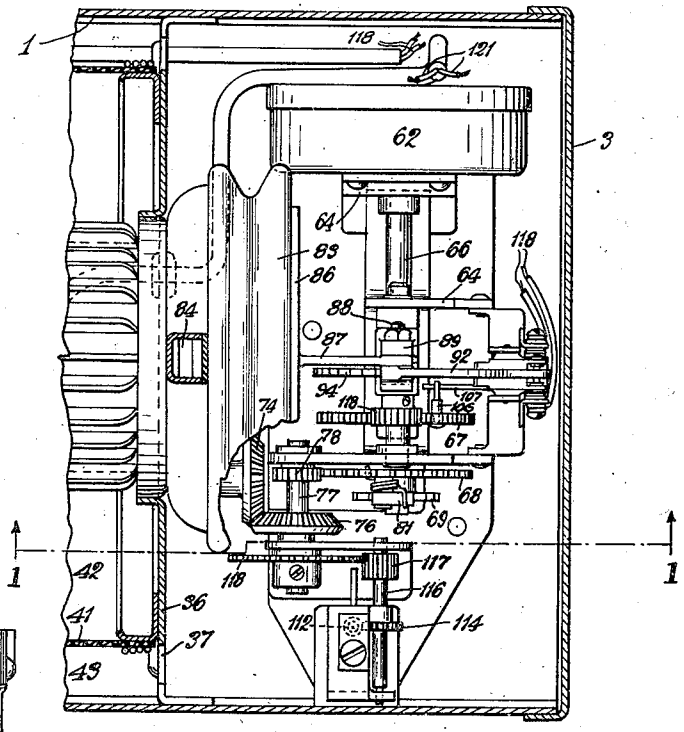


Fig. 5

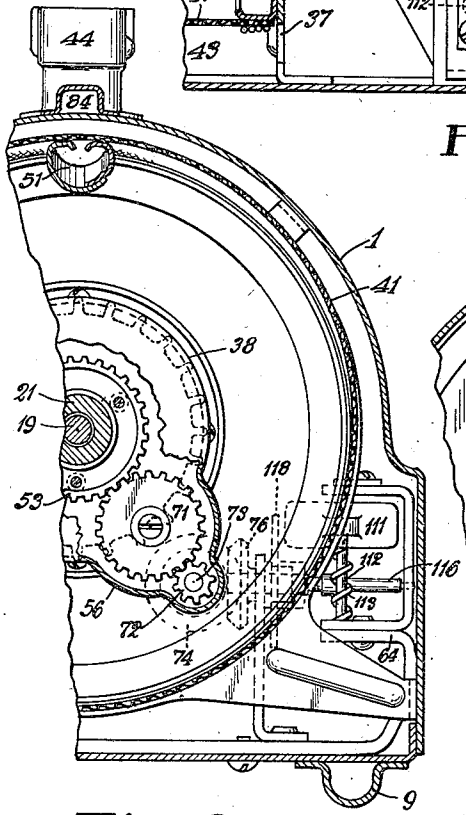


Fig. 6

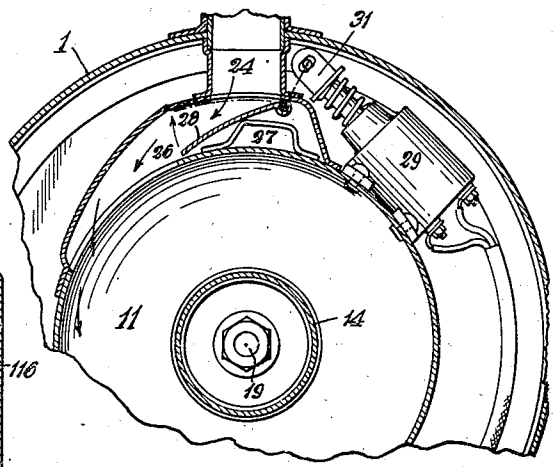


Fig. 7

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Patented June 4, 1946

2,401,394

UNITED STATES PATENT OFFICE

2,401,394

SUCTION CLEANER

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Application November 11, 1943, Serial No. 509,878

7 Claims. (Cl. 183—57)

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The present invention relates to suction cleaners in general and more particularly to a new and novel construction in which a dirt separator, including a filter element, is cleaned automatically under the actuation of a spring motor which is loaded by a pressure-operated bellows.

It is an object of the present invention to provide a new and improved suction cleaner. It is another object of the invention to provide a new and improved suction cleaner incorporating novel filter-cleaning means. A further object of the invention is to provide a suction cleaner in which a filter-cleaning nozzle is actuated by a spring motor which is energized by an air-pressure-actuated bellows. Still another object of the invention is to provide a suction cleaner in which an initial dirt separator has air drawn through it by suction-creating means which exhausts the air into a final dirt separator including a filter element, the latter element being cleaned by a filter-cleaning nozzle actuated by a spring motor which is itself energized by an air-pressure-actuated bellows. A still further object of the invention is to provide in a suction cleaner a filter-cleaning nozzle actuated by a spring motor which is energized by variations in air pressure within the machine and which automatically actuates the filter-cleaning nozzle under certain predetermined conditions. These and other more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith the attached drawings to which they relate.

Referring now to the drawings in which a preferred embodiment of the present invention is disclosed, and in which the same reference character refers to the same part throughout:

Figure 1 is a vertical longitudinal section through a suction cleaner constructed in accordance with a preferred embodiment of the invention, certain parts being shown in section upon the line 1—1 of Figure 5;

Figure 2 is a transverse section looking in the direction of the arrows upon the line 2—2 of Figure 1 and shows the actuating mechanism for the filter-cleaning nozzle;

Figure 3 is a section upon the line 3—3 of Figure 2 and shows the bellows-actuated means for energizing the spring motor;

Figure 4 is a partial view of the disclosure of Figure 3 but shows the relationship of the motor-energizing parts during their period of inactivity and in which the movement of the filter-cleaning nozzle takes place;

Figure 5 is a view looking downward within the rear of the cleaner casing which shows the filter-cleaning nozzle-actuating mechanism, a part of the bellows being broken away;

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Figure 6 is a section through the cleaner upon the line 6—6 of Figure 1 and discloses the mounting and the speed-reducing gearing of the filter-cleaning nozzzle;

Figure 7 is a section through the valve chamber and discloses the valve and the electrical solenoid which positions it.

In the modern suction cleaner of the type to which the present invention relates, means are provided to return the collected foreign material from a final filter to an initial dirt separator from which it can be removed readily and without the necessity of the operator shaking a bag or a filter. The initial separator is provided with a removable dirt container of material such as metal from which the foreign material is easily displaced. The cleaning of the final dirt separator is accomplished by means of a movable filter-cleaning nozzle which is actuated by a suitable spring motor. It is not necessary that the filter-cleaning nozzle be constantly at work but instead it need only perform its cleaning function periodically and with sufficient frequency to insure that the back pressure opposing the flow of air through the machine will not exceed a desirable maximum. In accordance with the present invention, use is made of the variation of cleaner air pressure to energize a spring motor by means of a bellows which expands and contracts with such air pressure variation. The spring motor is gradually energized and when completely loaded automatically actuates the filter-cleaning nozzle to perform its cleaning function. At the end of the cleaning cycle the parts are automatically reconditioned for the re-energization of the spring motor. The energization and cleaning operations occur in sequence and without the necessity of the operator giving any attention to the machine. The exact form of bellows and the exact form of the motor can be varied within the scope of the invention so long as the broad principles of energizing the spring motor by means of the air pressure variation, and subsequently actuating the filter-cleaning nozzle by the force of the spring motor, are used.

Referring now to the drawings in which a preferred embodiment of the invention is illustrated, a canister type suction cleaner is disclosed comprising an elongated outer casing 1 with a semi-cylindrical top and with a flat bottom. Casing 1 is closed by end plates 2 and 3, the latter being semi-permanently secured while the former is

provided with a handle 4 to aid in removal, being normally secured in place by manually releasable latch means 6. Removable cover 2 seats in air-tight relationship on the main body 1, an air seal 7 being present at their line of contact to insure this feature. Cover 2 also includes a dirt receptacle 8 which extends forwardly and into casing 1 along the lower surface thereof. The cleaner body is slidably supported upon skids or runners 9 which may be of any suitable shape or design and which function to support the machine slidably for movement over a supporting surface.

Within casing 1, and at what may be called the forward end thereof, is a whirl chamber 11, part of the length of which comprises a cylinder and part a truncated cone, the latter opening forwardly into the dirt receptacle 8. A fan chamber 12 is separated for whirl chamber 11 by a dividing wall 13, the inlet 14 of the fan chamber comprising an elongated inlet 15 which extends centrally into the whirl chamber. A strainer 16 is provided at the outer end of the inlet. Fan chamber 12 is itself divided into a first stage and a second stage by means of a fixed multi-vaned deflector member 17. A suction-creating fan 18 is positioned within each stage of the fan chamber and upon opposite sides of the deflector of member 17, the fans being carried by the extended end of a motor shaft 19. The hub 21 of the motor, which will later be described, extends into sealed relationship with the end wall 22 of the fan chamber. The fan chamber construction is completed by the presence of exhaust ports 23 in the second stage.

The whirl chamber 11 is connected to an inlet port 24 through a valve chamber 26 which extends tangentially of the whirl chamber at its cylindrical portion in order to direct air entering the whirl chamber. An air conduit 27 also extends into the valve chamber 26. Present in the chamber 26 is a pivoted valve 28 which is so positioned as to control selectively the connection of either the inlet port 24, or the air conduit 27, to the whirl chamber. To actuate valve 28 to move it between port-closing and conduit-closing positions, the latter position being shown in full lines in Figure 7, there is provided an electrical solenoid 29 which includes a spring-pressed armature 31 which normally holds the valve 28 in conduit-closing position with the whirl chamber connected to inlet 24.

The whirl chamber 11, the fan chamber 12, and the connected parts are held within the main casing 1 by means of a pair of transverse walls indicated by the reference characters 33 and 34. These walls are suitably shaped to perform their main supporting function and additionally the wall 34 is contoured so as to provide a filter-seating shoulder, as will hereinafter be set forth. Both walls serve to divide the casing into compartments.

Spaced rearwardly from the wall 34 is a third wall 36 which is fixedly carried in the casing 1 and is open around a large part of its outer edge to provide ports 37. Supported at its rearward end by the wall 36 is the cleaner driving motor 38, the casing of which is shown provided with suitable heat-dissipating flanges or fins and the shaft 19 of which extends forwardly into the fan chamber, as described. Wall 36 carries a flanged ring 39, and between ring 39 and the opposing wall 34 extends a cylindrical fabric filter 41. Filter 41 is spaced from the enclosing casing 1 and encloses the fan chamber 12 and motor 38.

The chamber comprising the filter 41 and the walls 34 and 36 is indicated by the reference character 42 and is known as the final filter chamber, or final dirt separator. The space surrounding the filter 41, and within the casing 1, is known as the discharge chamber and is indicated by the reference character 43. The air discharged from the exhaust ports 23 in the second stage of the fan chamber 12 passes into the final filter chamber 42, outwardly through the filter 41, and into the discharge 43. It then passes through the ports 37 in the wall 36 and into that part of the casing rearward of the rear wall 36 from which it escapes into atmosphere through the exhaust port 44. The latter is similar to the intake port 24 in order that dusting tools can be connected thereto when it is desired to use the machine as a blower rather than as a suction machine.

Sufficient mechanism has now been described to provide an operative suction cleaner usable over a limited period. The time limitation is imposed by the fact that some of the foreign material passing into the machine would not be removed by the initial separator or whirl chamber and would pass through the fan unit to be collected upon the final filter 41. If after an extended period of use filter 41 were not cleaned the resistance to the passage of air through the machine, known as the back pressure, would increase to such a point that the flow of air would be reduced and the operating efficiency would be materially reduced. To accommodate this characteristic means are provided to clean the filter 41 and to return the dirt to the initial dirt separator 11 from which it escaped. Dirt in the initial separtor collects in the dirt receptacle 8.

The filter-cleaning mechanism comprises a rotatable filter-contacting nozzle 51 the length of which is substantially equal to that of the filter 41 and which includes a conduit 52 which encloses the hub 21 of the motor 38 being carried rotatably by a large gear 53 mounted upon a bearing 54 on the motor hub. A housing 56 at the forward end of the motor casing encloses the gear 53, a suitable seal 57 being provided to prevent the air in chamber 42 entering the motor 38. Opposite the gear 53 the conduit 52 is provided with an open mouth which fits the circular end of conduit 27 which also encircles the motor shaft. A suitable seal 58 is provided at the joint to prevent air leakage.

As previously described, the valve 28 in the valve chamber 26 is adapted to connect the conduit 27 or the inlet port 24 to the interior of the whirl chamber 11. When the valve is positioned to permit the suction-creating means to draw air through the conduit 27 air will be drawn into the filter-cleaning nozzle 51 from the discharge chamber 43, through the filter 41, and will then pass through the passageway 52 and conduit 27 and into the whirl chamber 11. It carries with it foreign material which the nozzle has removed from the filter 41.

The means which actuate the filter-cleaning nozzle and move it over the interior surface of the filter 41 comprises a motor, the actuating force of which is derived from a spiral spring 61. The motor casing 62, to which the outer end of the spring 61 is secured, is carried by a framework 64 which is positioned within the casing 1 between the wall 36 and the end wall 3 of the casing, the framework being suitably shaped to support a plurality of parts as will be described. The inner end of the spring 61 is fixedly attached to a transversely extending shaft 66 which is

also carried by the framework 64 and which itself carries, at a distance from the casing 62, a large gear 67, fixed to the shaft 66. Also mounted upon the shaft 66, but rotatable relative thereto, is a large gear 68 and also mounted on the shaft a ratchet gear 69 which is fixed. The filter-cleaning nozzle 51 is connected to the shaft 66, which is directly driven by the driving spring 61, through gears and a power-transmitting shaft. A pair of gears 71 and 72 connect the nozzle-carrying gear 53 to a shaft 73 which extends parallel to the motor shaft and passes through the wall 36 to be provided at its rearward end with a pinion gear 74. The latter meshes directly with a bevel gear 76 on a short shaft 77 which shaft also carries a small gear 78 in mesh with the gear 68 on the shaft 66. The preferred gear ratios are such that the complete unwinding of the spring 61 produces about one and one-fourth revolutions of the filter-cleaning nozzle 51.

As the motor spring 61 must be wound, requiring the shaft 66 to move in a direction opposite to its normal direction when actuating the filter-cleaning nozzle 51, it is desirable to provide clutch means which will permit the shaft 66 to be rotated in one direction without moving the nozzle. This is accomplished by mounting a spring-pressed pawl 81 upon the large freely rotatable gear 68 upon the motor shaft 66. Pawl 81 is spring-pressed into contact with the ratchet gear 69 fixed upon the shaft 66, the teeth of the ratchet gear being so shaped that when the shaft 66 rotates in a counter-clockwise direction as viewed in Figure 1, under the actuation of the spring 61, the teeth of the ratchet gear engage the pawl 81 and the rotation of the shaft is transmitted to the large gear 68. Rotation of the latter gear, of course, effects the movement of the nozzle through the described gear train and shaft 73. Rotation of the shaft 66 in the opposite direction, as when winding the spring 66, permits the pawl 81 to slide over the teeth of ratchet gear 69 without movement of the large gear 68 or of the nozzle 51 connected thereto.

To load the spring 61 automatic means are provided comprising a pressure-actuated bellows 83 which is suitably mounted upon the rear face of the wall 36 in the casing 1 and which is interiorly connected through a conduit 84 to the intake 24 of the cleaner, and accordingly to the suction-creating means during normal cleaner operation. Bellows 83 includes a rigid movable plate 86 which is spring-pressed rearwardly to expand the bellows by an internal coil spring 87. Spring 87 tends to expand the bellows at all times but its strength is such that it is overcome and compressed by the collapse of the bellows when a sufficiently high suction acts thereon. The degree of suction acting on the bellows is, of course, dependent upon the suction present at the inlet 24 and that in turn is determined by the contact of the nozzle with the surface being cleaned. A good seal at the nozzle produces an increased suction and the bellows collapses. No seal at the nozzle results in an increased air flow, low suction, and the bellows expands under the spring action.

To transmit the movement of the bellows into a spring-winding effect there is provided a rigid rod 87 upon the face 86 of the bellows which rod seats at its end upon a pin 88 carried by a substantially vertical rocker arm 89. Arm 89 is pivotally mounted upon a shaft 91 fixedly mounted in the framework 64. An elongated pawl 92 is also pivotally mounted on pin 88. The pawl end

is bifurcated, one end 93 being shaped to engage a large diameter ratchet gear 94 having teeth which are shaped to engage the pawl when the pawl is moved toward the front of the cleaner by the collapse of the bellows under the action of the suction therein. The second end of the pawl 92, indicated at 96, is separated from the gear-contacting end 93 by a cam surface 97, the function of which will become apparent. To transmit the counter-clockwise rotation of ratchet gear 94, counter-clockwise as viewed in Figures 1, 3, 4, there is provided a second small diameter gear 98 fixed upon the same shaft 91 as gear 94 which gear meshes with rotatable gear 67 fixed upon the motor shaft 66. As shaft 66 is rotated in a clockwise direction the spring, fixed thereto, is wound. This clockwise movement, reference being had to Figure 3, does not effect nozzle movement for the teeth of ratchet gear 69 slide past the pawl 81 and pawl-carrying gear 68, through which power to the nozzle must pass, does not rotate.

Means must be provided to prevent the spring motor from unloading before it is completely wound, and also during the time the pawl 92 is advanced on the ratchet gear 94. Additionally, means should be provided which will automatically start into operation the filter-cleaning nozzle. In the present invention a novel construction has been provided to accomplish both of these results. Specifically, a pivoted locking detent 101 is pivotally mounted upon a sub-frame 102 of the general framework 64. The detent 101 is formed with a pair of spaced side arms and, at its forward end, is adapted to engage the teeth of ratchet section 94 somewhat in the manner of the end 93 of the bellows-actuated pawl 92. Detent 101 remains in its locking position, illustrated in Figure 3, during normal cleaner operation. It prevents gear 94 from rotating in a clockwise direction, as viewed in Figure 3, as it does in the unwinding of spring 61. It permits ratchet gear 94 to rotate in the opposite direction, however, under the actuation of the bellows actuated detent 92. A pin 103 is provided between the side walls of detent 101 which is insulated from the remainder of the detent and for a purpose which will become apparent.

When the spring 61 of the spring motor has been wound to a predetermined degree it is desirable that the filter-cleaning nozzle be actuated. This requires that the detent 101 be removed from locking engagement with the ratchet gear 94. To accomplish this, there is provided a pin 106 upon the large gear 67. This pin, movable with the gear 67 in its rotation and as the spring 61 is wound, moves into contact with a lever arm 107 which is also carried by the sub-frame 102 and which at its end carries a spring and plunger unit 108, the plunger extending slidingly through the top surface of detent 101. The relationship between the lever 107, detent 101, and the spring-plunger is such that unit 108 is adapted to move overcenter with respect to the pivotal axis of the detent 101 as the lever arm 107 is pivoted by the pin 106 from the position illustrated in Figure 3 to the position illustrated in Figure 4. When this occurs the detent 101 moves with a snap action from its position of Figure 3, in which it held the ratchet gear 94 locked against clockwise rotation under the actuation of the spring 61, to a position in which the gear 94 is free to rotate. In moving from the locking position to the unlocked position, the locking end of detent 101 rides along the curved cam surface of the pawl 97 and in its

final position, illustrated in Figure 4, contacts the end 96 of the pawl and holds that member from the ratchet gear 94 so that the latter is entirely free to rotate. The snap action movement of the detent 101 with its release of the gear 94, and also the release of the gear by the pawl 92, is effected at some point in the movement of the pin 106 on gear 67 from the position shown in Figure 3 to that shown in Figure 4.

The parts are shown related in Figure 4 in their position in which the spring has been completely wound and has just started its nozzle-driving operation. The rotation of the gear 67 will continue counter-clockwise until the pin 106 rotates through slightly more than 360 degrees and has moved the lever arm 107 sufficiently to pivot it and bring the spring unit 108 overcenter with respect to detent 101 thereupon moving that element back into locking engagement with the gear 94. Further clockwise rotation (Figures 3 and 4) of the ratchet gear 94 is then prevented and there begins a cycle of winding the spring under the actuation of the detent 92 which has been returned to engagement with the ratchet 94 upon the detent returning to its locking position, as illustrated in Figure 3.

To prevent excessive speed of movement of the filter-cleaning nozzle, and a corresponding excessive rate of discharge of the force of the spring, a governor is provided in the form of a paddle wheel 111 which is carried by vertical shaft 112 on the framework 64. A worm gear 113 is provided upon shaft 112 which meshes with a gear 114 on a horizontal shaft 116. The latter carries a second gear 117 which in turn meshes with a large diameter gear 118 carried by the shaft 77 which also carries the bevel gear 76. The paddle wheel 111 acts in the well known manner of a governor to prevent excessive rotation of its own shaft and accordingly of those parts which are geared to it.

The filter-cleaning nozzle 51 must be interiorly connected with the suction-creating means during the period of actuation or no cleaning effect will result. To bring this about the valve 28 within the valve chamber 26 is moved into position to close the inlet port 24 and to open the conduit 27 leading to the nozzle. This is accomplished by energizing solenoid 29. A pair of current-conducting leads 118 connected to the incoming power leads 121 are connected in series with a pair of contacts 119. Contacts 119 are carried by the sub-frame-work 102 and are so positioned and related as to be contacted and interconnected by the pin 103 at the end of detent 101 in the open position of the latter, as illustrated in Figure 4. The pin and the contacts are suitably insulated so that no current is transmitted to the other working parts and it is seen that the detent performs the function of a switch blade to close the contacts when in the position illustrated in Figure 4 in which the spring motor is discharging its energy.

The description of the machine is completed by stating that the electric motor 38 is connected to the incoming power leads 121 which pass through a manually operable current-controlling switch 122 as in the usual suction cleaner. The solenoid leads 118 are connected across the current-conducting leads 121 and the energization of the solenoid does not affect the current to the motor.

The operation of the suction cleaner constructed in accordance with the present invention is as follows: The operator having connected the dusting tools, including a cleaning nozzle, to the inlet 24, he closes the motor-controlling switch 122 and current flows through the motor 38. The suction-creating fans 18 thereupon revolve with the motor shaft 19 and a reduced pressure is created within the whirl chamber 11. Dirt-laden air is drawn through the dusting tools, through the inlet 24 into the valve chamber 26, and into the whirl chamber 11. Foreign material in the air is separated by centrifugal action and passes radially outward into contact with the walls of the whirl chamber and moves forwardly and from its truncated conical end into the dirt receptacle 8. The cleaned air, together with any fine dust not removed therefrom, passes via the inlet 14 into the fan chamber and is exhausted therefrom through the fan chamber exhaust ports 23 into the final filter or dirt separator 42. The air is forced outwardly through the filter 41 into the discharge chamber 43 and makes its way through the ports 37 into the rear of the casing to escape from the cleaner at the exhaust port 44. This cleaning operation continues, the operator from time to time lifting the cleaning nozzle.

The suction in the whirl chamber 11 and in the inlet 24 is effective within the bellows 83 which is interiorly connected thereto through the conduit 84. When the nozzle at the end of the dusting tool hose is sealed the suction within the dusting tools and the inlet 24 is reduced and the bellows 83 collapses. Each time this takes place the pawl 92 is moved to rotate the ratchet gear 94 in a counter-clockwise direction. When the seal of the dusting tool nozzle with the surface being cleaned is broken the pressure within the inlet 24 increases, that is, the suction decreases, the bellows expands under the pressure of its internal spring 87, and the pawl 92 advances to take another tooth or teeth on the ratchet gear 94. Repeated expansions and contractions of the bellows result in the winding of the spring motor spring 61, as described.

The winding operation continues until the spring is fully wound, accomplished when the shaft 66 driven by pawl-actuated ratchet gear 94 has advanced through slightly more than 360 degrees. During the last part of this movement the pin 106 on the gear 67 has tripped the detent-actuating lever 107 effecting the movement of the detent 101 from its ratchet-gear-locking position to its filter-cleaning nozzle-operating position, illustrated respectively in Figures 3 and 4. Ratchet gear 94, which is geared directly to the shaft 66, as described, is then free to rotate under the actuation of the motor spring 61. The movement of the detent also has resulted in the closing of the solenoid switch 119, as described, and the solenoid upon being energized has moved the valve 28 so as to connect nozzle 51 through the valve chamber 26 to the whirl chamber 11.

The shaft 66 is now free to rotate under the actuation of the spring 61 and this it does in a counter-clockwise direction, as viewed in Figure 4, the ratchet gear 69 upon the shaft engaging the pawl 81 upon the large diameter gear 68 which gear in turn drives the gear train and shaft 73 connected to the nozzle. The nozzle 51 is rotated around the inner surface of the filter 41 for slightly more than one revolution and during this operation cleaning air is drawn from the discharge chamber 43, inwardly through the filter 41 into the nozzle 51 to be drawn into the whirl chamber 11 where the foreign material which has previously escaped is this time removed and deposited in the dirt receptacle 8.

The filter-cleaning operation continues until

the spring 61 has discharged substantially its entire force at which time the pin 106 upon the gear 67 has rotated sufficiently to pivot the lever 107 and to cause the detent 101 to move, under the over-center action of the spring unit 108, into locking position relative to the ratchet gear 94. The change is from the position illustrated in Figure 4 to that illustrated in Figure 3. The pawl 92 has then again moved into operative relationship with the gear 94. The solenoid 29 has been de-energized by the opening of the switch 119 and the valve 28 has disconnected the filter-cleaning nozzle from the suction-creating means. The machine is then again organized for normal cleaning with the filter-cleaning unit remaining inoperative. The spring motor is then again wound.

From time to time it is necessary for the operator to remove the collected foreign material from the machine and this is accomplished merely by releasing latch means 6, withdrawing the cover 4 longitudinally by use of the handle 4, and dumping from the receptacle 8 the collected foreign material therein. The material is easily displaced, the receptacle 8 being of metal or similar smooth material to which the collected material does not adhere with tenacity.

I claim:

1. In a suction cleaner of the type having an initial dirt separator, an inlet for a dirt-laden air stream to said separator, suction-creating means to draw air through said initial separator, and a final dirt separator connected to receive air from said suction-creating means; a cleaning nozzle for said final separator, air-conducting means in place at all times during cleaner operation to connect said nozzle to said initial separator, a spring motor connected to said nozzle to move same with respect to said final separator, air-pressure-actuated means operatively connected to said suction-creating means to wind said motor, and means to release said motor to actuate said nozzle.

2. In a suction cleaner of the type having an initial dirt separator, suction-creating means to draw air through said initial separator, and a final dirt separator connected to receive air from said suction-creating means; a cleaning nozzle for said final separator, and air-conducting means connecting said nozzle to said initial separator, a spring motor connected to said nozzle to move same with respect to said final separator to remove dirt therefrom, a pressure-actuated bellows interiorly connected to the intake side of said initial separator, means operatively connecting said bellows to said motor to wind the latter, means controlling the flow of air through said air-conducting means from said nozzle to said initial separator, and means to release said motor to actuate said nozzle upon said motor becoming wound to a predetermined point.

3. In a suction cleaner of the type having an initial dirt separator, suction-creating means to draw air through said initial separator, and a final dirt separator connected to receive air from said suction-creating means; a cleaning nozzle for said final separator, air-conducting means connecting said nozzle to said initial separator, a spring motor, means connecting said motor to said nozzle including clutch means to enable said motor to rotate in one direction during the winding operation without movement of said nozzle, air-pressure-actuated means connected to said suction-creating means to rotate said motor in said one direction, valve means controlling the flow of air through said air-conducting means, and means to operate said valve means to permit the flow of air through said air-conducting means during the movement of said nozzle and to disconnect said air-pressure-actuated means from said motor.

4. In a suction cleaner of the type having an initial dirt separator, suction-creating means to draw air through said initial separator, and a final dirt separator connected to receive air from said suction-creating means; a cleaning element for said final separator, a spring motor to move said element relative to said final separator, means to control the operation of said spring motor, and an air-pressure-actuated motor connected to said suction-creating means and actuated by variations in the pressure of air moved thereby connected to said spring motor to wind same.

5. In a suction cleaner, a dirt separator, a movable element to remove dirt from said separator, suction-creating means connected to said separator, a spring motor to actuate said element relative to said separator, air-pressure-responsive means connected to said suction-creating means and subject to variations in the air pressure created by said suction-creating means, means to transmit the movement of said air-pressure-responsive means into a winding force at said spring motor, and means to release said spring motor to actuate said element.

6. In a suction cleaner, a dirt separator, a movable element to remove dirt from said separator, suction-creating means connected to said separator, a spring motor to actuate said element relative to said separator, an expansible bellows interiorly connected to the intake side of said suction-creating means and including spring means opposing the collapsing force of said suction-creating means, means to transmit the movement of said bellows into a winding force at said spring motor, means to release said spring motor to actuate said element upon a predetermined loading of said motor, and a governor to control the rate of discharge of the energy stored in said motor.

7. In a suction cleaner, a dirt separator, a movable element to remove dirt from said separator, suction-creating means connected to said separator, a spring motor to actuate said element relative to said separator, air pressure responsive means connected to said suction-creating means, means to transmit the movement of said air pressure responsive means into a winding force at said spring motor and including a pawl actuated by said air pressure responsive means and a ratchet connected to said motor, means to disconnect said pawl from said ratchet under predetermined conditions to enable said motor to discharge its stored energy, and means to limit the rate of discharge of said energy.

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