Nov. 2, 1943. E. L. SNYDER 2,333,494

SUCTION CLEANER

Filed Sept. 11, 1942 3 Sheets-Sheet 1

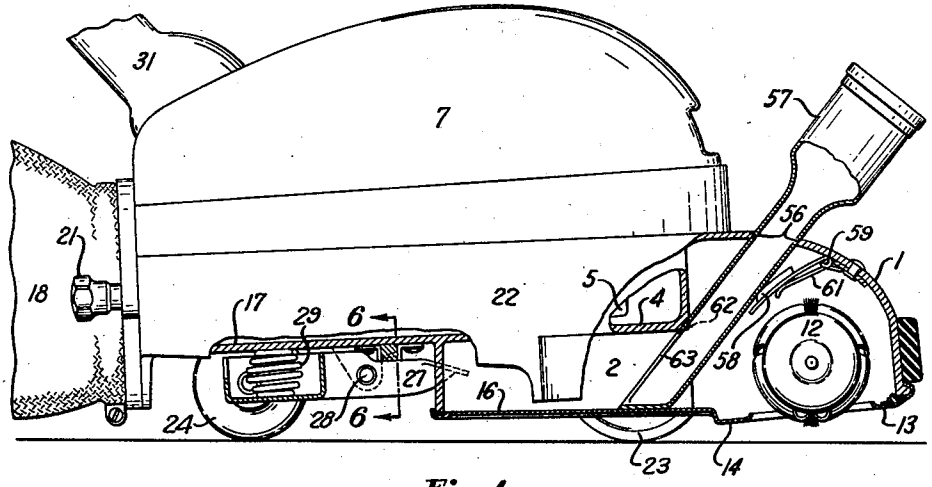

Fig. 1

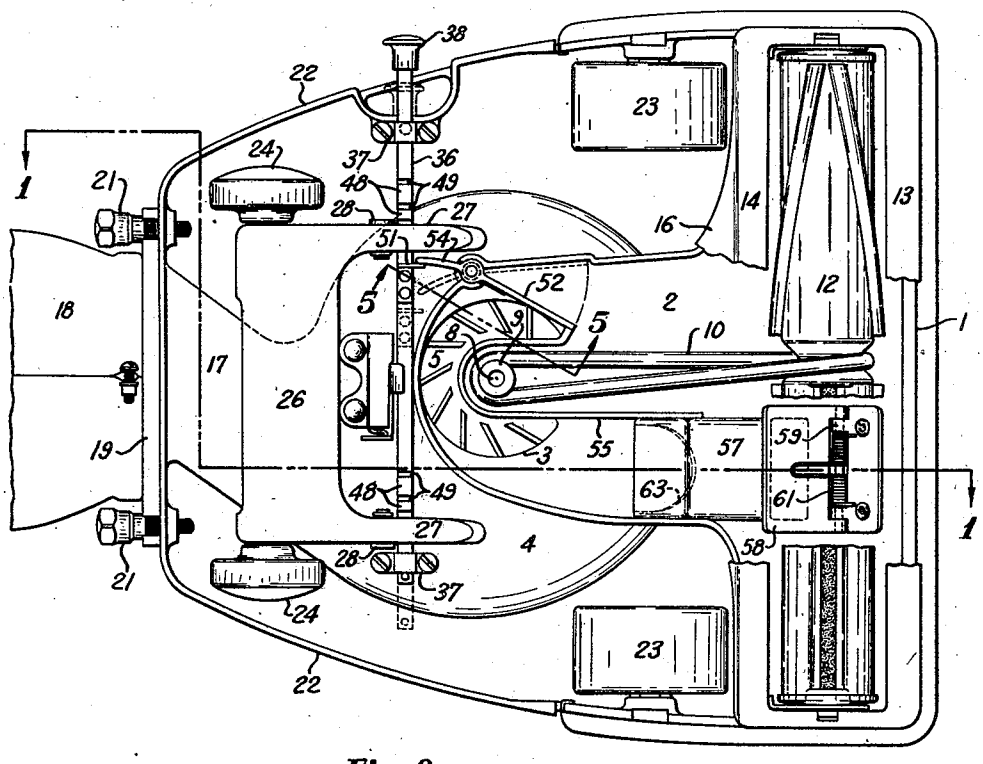

Fig. 2

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SUCTION CLEANER

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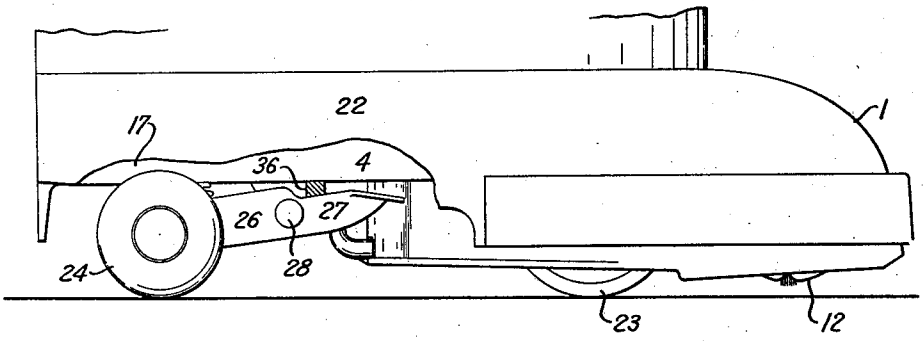

Fig. 3

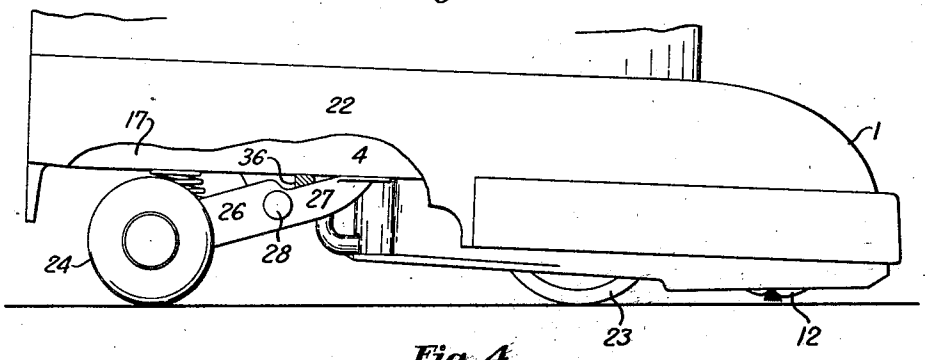

Fig. 4

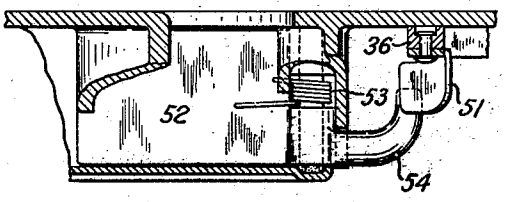

Fig. 5

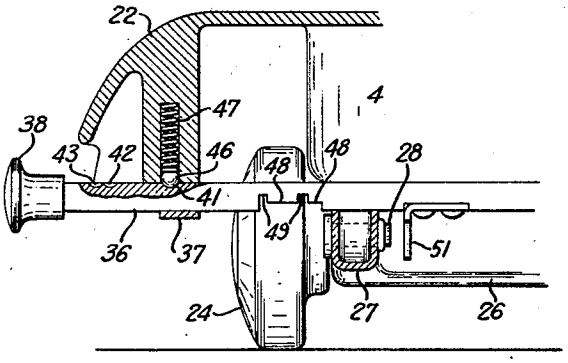

Fig. 6

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SUCTION CLEANER

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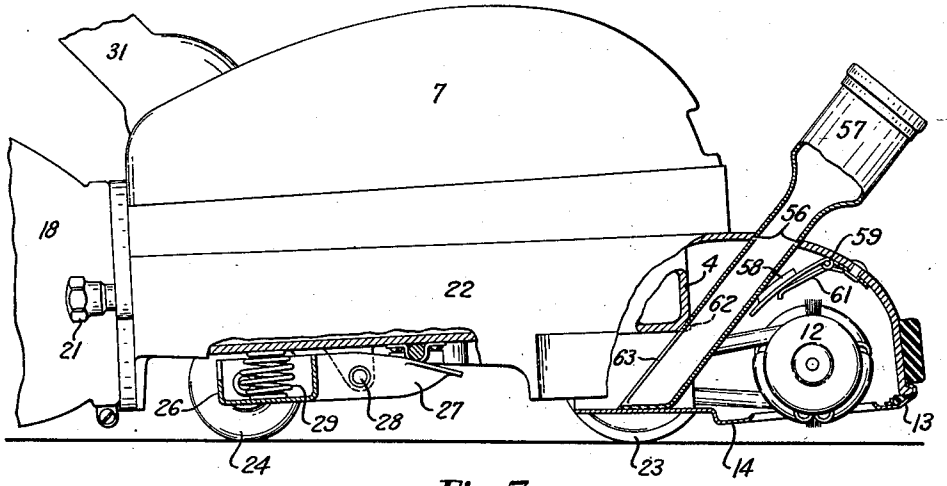

Fig. 7

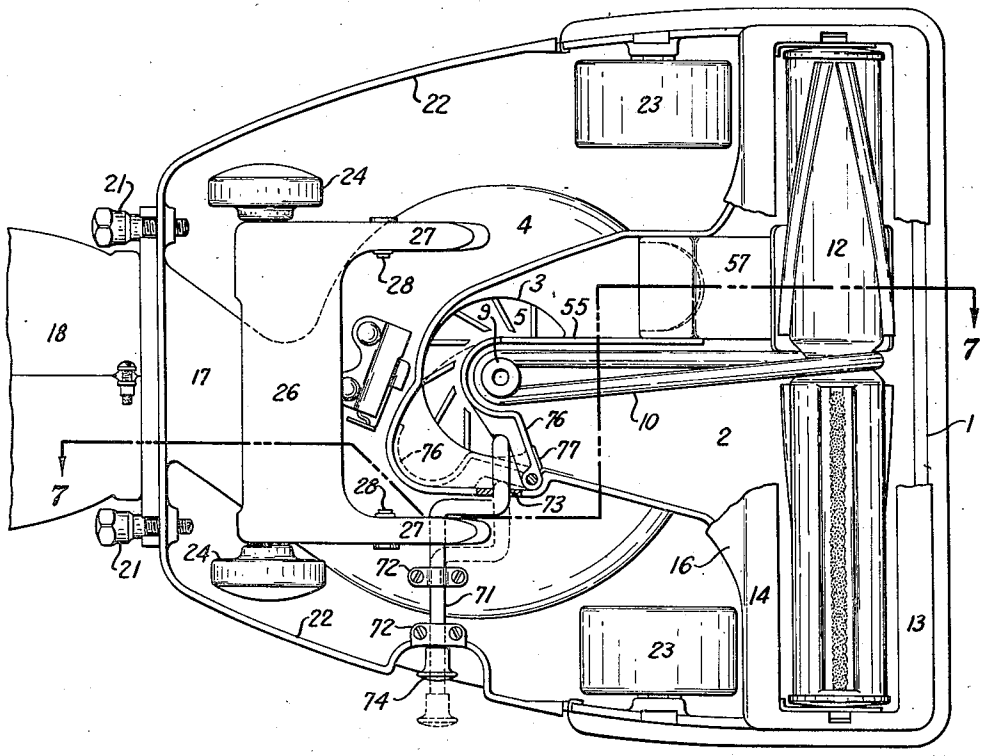

Fig. 8

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Patented Nov. 2, 1943

2,333,494

UNITED STATES PATENT OFFICE

2,333,494

SUCTION CLEANER

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Application September 11, 1942, Serial No. 457,942

10 Claims. (Cl. 15—9)

The present invention relates to suction cleaners generally and more particularly to a new and novel improved mechanism for converting the cleaner from an on-the-floor unit to an off-the-floor unit. More specifically the invention comprises improvements in a suction cleaner construction which render the surface agitating means functionally inoperative during off-the-floor cleaning and which enable the converting tools to be inserted into the cleaner body from directly above.

Referring to the drawings in which preferred embodiments of the invention are disclosed:

Figure 1 is a side view, partly in section, of a modern suction cleaner embodying the present invention in the off-the-floor cleaning condition with the dusting tool converter attached and the nozzle raised to inoperative position;

Figure 2 is a bottom view of the cleaner illustrated in Figure 1 with a part of the bottom plate broken away;

Figure 3 is a partial side elevation of the cleaner illustrated in Figure 1 in on-the-floor cleaning condition, the nozzle being in the high surface-contacting position;

Figure 4 is a view similar to Figure 3 but showing the nozzle in the low surface-contacting condition;

Figure 5 is a section upon the line 5—5 of Figure 2 and comprises an enlarged showing of the manually operable valve in the air passageway;

Figure 6 is section upon the line 6—6 of Figure 1 and discloses the manually operating means by which the nozzle height is adjusted and the air passageway valve operated;

Figure 7 is a side elevation of a cleaner constructed in accordance with a second preferred embodiment of the invention in the off-the-floor cleaning condition, certain parts being broken away and shown in section upon the line 7—7 of Figure 8;

Figure 8 is bottom view of the cleaner illustrated in Figure 7, part of the bottom plate being broken away.

The modern suction cleaner is designed primarily for the cleaning of surface coverings. When functioning in this primary capacity it is commonly called an on-the-floor cleaner. There are many articles positioned above the supporting surface which can be cleaned by the use of the cleaning air which passes through the cleaner. When the cleaner is provided with dusting tools so that it is capable of cleaning these articles positioned above the floor surface it is commonly called an off-the-floor cleaner.

It has long been the practice to convert an on-the-floor cleaner into an off-the-floor cleaner by the attachment of dusting tools of a common and well known type comprising a converter element attachable directly to the cleaner in order to make the cleaner suction available at the end of a flexible tubular hose. The usual cleaner, in order to have maximum efficiency to perform its on-the-floor cleaning operation, is provided with surface agitating means. These are normally positioned within the cleaner nozzle, and when the cleaner is performing its off-the-floor cleaning function it is desirable that they be rendered functionally inoperative. A preferred manner of accomplishing this result is to raise the cleaner nozzle, within which the agitating means are usually positioned to an inoperative position, so that the agitating means are unable to contact the surface covering upon which the cleaner rests. In the cleaner construction in accordance with the present invention new and novel means have been provided to raise the cleaner nozzle to an inoperative position when the machine is engaged in off-the-floor cleaning. Additionally, the cleaner is so constructed that it is possible to insert the converter element directly into the cleaner casing from above with maximum ease.

Referring now to the drawings the first embodiment of the invention is illustrated in Figures 1 to 6, inclusive. A suction cleaner is seen to comprise a nozzle 1 interiorly connected by an air passageway 2 to the eye 3 of a fan chamber 4 which houses a rotary suction-creating fan 5. An unshown motor is positioned immediately above the fan chamber 4 within a motor casing 7, the motor shaft 8 extending downwardly through the fan chamber 4, where it carries the fan 5, to be provided at its lower end with a pulley 9. The latter drives a power-transmitting belt 10 which extends forwardly within the air passageway 2 and seats upon the pulley surface formed in the rotary agitator 12. The agitator within the nozzle 1 is so positioned as to be adapted to contact a surface covering when lifted by suction existing within the nozzle, when the latter is positioned in an on-the-floor position as in Figures 3 and 4, into contact with the front and rear nozzle lips 13 and 14, respectively. These lips are formed integrally in the bottom plate 16 which closes the air passageway 2. The fan chamber 4 is formed with a rearwardly extending exhaust passageway 17 and to the outer end thereof is removably attached a dust bag 18, the ring 19 of which is removably retained by clamping bolts 21. The latter are screw-threaded

into the flange surrounding the exhaust outlet 17 and formed by extensions of encircling side walls 22 of the cleaner body.

The front of the cleaner is movably supported upon front wheels 23 positioned immediately in the rear of the nozzle mouth and fixedly carried by the side walls 22. The rear of the cleaner body is supported by rear wheels 24 which are carried by a stamped U-shaped frame 26 pivoted on spaced pivots 28 to the underside of the cleaner body. Forwardly of the pivots frame 26 is provided with arms 27 each of which comprises spaced side walls and a connecting bottom wall, the end of each arm being formed as a flat horizontal surface adapted to contact the underside of the fan chamber 4 in one position of the frame 26.

The rear of the frame 26 carrying the rear supporting wheels 24 is at all times spring-pressed downwardly by the action of one or more coil springs 29 so that the frame arms 27 are at all times urged upwardly. The cleaner is provided with a pivoted handle 31 by means of which the machine can be propelled in on-the-floor cleaning. This handle is pivotally mounted within the motor casing 7 and near the rear of the body.

The on-the-floor operation of this machine, as illustrated in Figures 3 and 4, is similar to the usual on-the-floor cleaner. The cleaner motor is actuated by the flow of electric current therethrough under the control of switch means as in the usual suction cleaner. The rotation of the suction-creating fan 5 effects a reduced pressure within the air passageway 2 resulting in the drawing of air into the nozzle 1 between the lips 13 and 14, and in the rotation of the agitator 12 upon the rotation of the pulley 9 connected to the belt 10. The surface covering upon which the cleaner is positioned is lifted into contact with the front and rear lips 13 and 14 and is brushed and beaten by the rotary agitator 12. The cleaning air drawn into the nozzle carries away the foreign materials dislodged from the surface covering and this passes through the air passageway 2, the fan chamber 4, via the exhaust outlet 17 into the filtering bag 18. The propulsion of the machine over the surface covering by the operator through the use of the handle 31 enables the entire surface covering undergoing cleaning to be cleaned easily and readily.

Possibly in transferring the cleaner from one surface covering to another, the operator will desire to change the height of the nozzle mouth above the surface covering because of different pile density, stiffness or length. To accomplish this adjustment the cleaner is provided with a transversely slidable bar 36 carried by brackets 37 on the underside of the cleaner immediately rearward of the air passageway 2 and formed at its outer extremity as a manually operable knob 38. Bar 36 extends between the arms 27 and the underside of the fan chamber 4 and has in its upper surface three spaced detent seats 41, 42, 43, respectively, representing three positions of adjustment. To cooperate with these seats to retain the bar in adjusted position is a spring-pressed ball detent 46 positioned in a thickened portion of the body side wall 22 and urged toward the bar by a spring 47. The underside of the bar 36, that is contacted by arms 27, is formed with duplicate pairs of stepped seats 48 and 49, one pair of each arm 27. The seats 49 of each pair are spaced apart so that when the bar 36 is manually pushed inwardly to its innermost position, the detent 46 then seating in its seat 43, the side walls of each arm 27 of the bracket 26 contacts a seat 49, being held in place by the spring 29. In this position the forward end of the bracket 26 is in its uppermost position and the rear wheels 24 are in their lowermost position. This results in the nozzle being in its lowest position which can be termed the low operating position. From this position and with the side of the arms 27 positioned in seats 49 in order to adjust the nozzle to a new position, it is necessary to depress the rear of the machine, thereby moving the rear of bracket 26 and the wheels 24 toward the underside of the machine and correspondingly lowering the arms 27. This movement of arms 27 displaces the side walls thereof from the seats 49 and permits the operator to adjust the bar 36 by use of the knob 38.

With the rear of the machine so depressed the bar 36 can be adjusted manually until the detent 46 seats within the detent seat 42 at which time the side walls of the arms 27 of bracket 26 will be opposite the surfaces of seats 48. Releasing the rear of the machine enables the spring 29 to force the rear wheels downwardly and the side walls of arms 27 against seats 48. When so positioned the nozzle is in a slightly higher position than that just described. This second position may be called the high operating position. Actually, the nozzle can be lowered from this high operating position to the low operating position merely by forcing the knob 38 inwardly to slide the bar 36 until the arms 27 slip from seats 48 into seats 49.

The third position of the nozzle finds the detent 46 positioned within the detent seat 41. When the bar 36 is transversely positioned to effect this relationship, the side walls of the arms 27 of the bracket 26 are in contact with the normal under surface of the bar 36 and the rear wheels 24 are in their uppermost position. This produces a raised condition at the nozzle as illustrated in Figure 1 in which the surface-contacting lips 13 and 14, and the agitator 12 therebetween, are out of contact with the surface covering positioned therebelow. The nozzle and the agitator are then in an inoperative position and are unable to contact the surface covering positioned therebelow. From this last position the nozzle can be adjusted progressively first into the high operating position and then into the low operating position by virtue of the stepped relationship of the seats 48 and 49. Nozzle adjustment in the reverse sequence, however, is, as described, possible upon depressing the rear of the machine.

The transverse manual movement of the nozzle height-adjusting bar 36 also produces a separate and secondary result. Carried by the underside of the bar at a point adjacent the rear of the passageway 2 is a forwardly extending bracket arm 51. The lateral movement of the bar 36 moves this arm between the full line and dotted line positions illustrated in Figure 2, to effect a result soon to be made clear.

Carried by one side wall of the air passageway 2 and pivotally mounted therein is a valve element 52 which is adapted to move between the full line closed position and the dotted line open position illustrated in Figure 2, being normally spring-pressed by a coil spring 53 to the open position. Valve 52 carries a rearwardly extending finger 54 which reaches into the pathway of the aforedescribed arm 51, carried by the bar 36. The

movement of the bar 36 to its outermost position, illustrated in Figures 1 and 6, and in which the nozzle is in its uppermost and inoperative position, causes the arm 51 to pivot the finger 54 against the force exerted by the coil spring 53 to move the valve 52 from its open position along one side of passageway 2 to its closed position in which it extends transversely across one side of that air passageway.

Passageway 2 is formed with a centrally located wall 55 which extends from a position adjacent the valve 52 in its closed position, as illustrated in Figure 2, rearwardly around the driving pulley 9 and then parallel to the driving belt in the direction of the agitator and nozzle to a point somewhat rearwardly of the rear nozzle lip 14. This wall 55 in effect divides the air passageway 2 into two parts, one of which can be closed by the valve 52 in the manner illustrated in full lines in Figure 2. The bottom wall of fan chamber 4 extends rearwardly into the fan eye between the sides of wall 55 to form therewith an island in front of and around the shaft 8 which prevents the passage of air at that point.

The top wall of the nozzle 1 is formed with a converter receiving opening or port 56 which is adapted to receive and seat the elongated end of a converter element 57. Opening or port 56 is normally closed by a valve 58 pivotally mounted on the inside of nozzle 1 at 59 and which is spring-pressed to closing position by a spring 61. Converter element 57 is of a size and shape to extend downwardly and rearwardly through the converter port 56 into seating and sealing relationship with that part of the air passageway 2 located between the wall 55 and the opposite exterior wall of the passageway 2, as is clearly illustrated in Figure 2. As the converter element is inserted the valve 58 spring-presses it rearwardly and the rearward side thereof is guided by contact with the forward edge of the fan chamber 4 which is preferably provided with suitable spaced guiding shoulders 62. The inserted end of the converter element 57 is shaped to conform to the bottom wall of the air passageway 2 and is formed with a rearwardly facing opening 63 which interiorly connects it to the passageway portion leading to the fan eye.

With the valve element 52 in its closed position, resulting in the closure of one-half of the air passageway 2, and with the converter element 57 inserted through its port 56 and closing from the nozzle the other half of the air passageway 2, the entire suction of the suction-creating fan 4 is effective to draw air in through the converter element 57, through its port 63 and into the fan chamber. When the machine is so related it is adapted, upon the connecting of suitable dusting tools to the converter element, for off-the-floor cleaning. The return of the machine to an off-the-floor cleaner requires only the manual removal of the converter element 57 which results immediately in the spring-pressed valve 58 returning to its port-sealing position. Thereafter the manual depressing of the rear of the machine and the transverse manual movement of the bar 36 to position the nozzle in either its high or low operating positions results in the movement of the valve 52 to its inoperative position along the side wall of the air passageway 2. The machine is then ready for on-the-floor cleaning.

Referring now to Figures 7 and 8 in particular the second preferred embodiment of the invention is illustrated. This embodiment of the invention is much like that previously described and the material distinctions only will be here referred to. The transversely movable nozzle-position-controlling bar 36 of the first embodiment has been discarded and in its place has been used a two-position transverse shaft 71 which extends under the fan chamber being supported by brackets 72. Shaft 71, which carries a knob 74 at its outer end, is formed with a forwardly extending portion and then with a continuing laterally extending portion which is adapted to move through an aperture 73 formed in the adjacent contoured wall of the air passageway 2. The two positions of the shaft 71 are clearly illustrated in Figure 8. In one of these positions, the inner, the shaft 71 underlies the adjacent arm 27 of the rear wheel-carrying bracket 26 and when so positioned results in the rear wheel being positioned more closely against the cleaner body and accordingly in the nozzle being raised to its inoperative position as illustrated in Figure 1. In the second position of the shaft 71, as shown in dotted lines in Figure 8, it does not underlie the arm 27 of the bracket 26 and that arm and also its counterpart contact the underside of the fan chamber to position the rear wheels in their lowermost position. This results in the nozzle being lowered to its on-the-floor cleaning surface-contacting position.

With the present embodiment the centrally positioned dividing wall 55 in the air passageway 2 does not extend rearwardly and around behind the driving pulley 9 but instead extends only to a point substantially opposite the center of that pulley. In place of the valve 52 of the first embodiment there has been substituted a contoured valve 76 formed at its outer end with a curved portion which is adapted to extend around the pulley and abut the rear end of the stationary wall 55. The side wall of the air passageway 2 has been contoured to accommodate the shape of valve 76 when in its open position in which it is normally spring-held by the coil spring 77 at its pivot point. As is clearly seen in Figure 8 the inner extended end of the shaft 71 is adapted to contact the valve element 76 upon entering the air passageway through the opening 73 and when the shaft 71 is moved laterally inwardly, as from the dotted line to the full line position of Figure 8, the valve 76 is pivoted. The valve movement is from the dotted line position to the full line position as shown in Figure 8. The top wall of the air passageway, as in the previous embodiment, is extended into the eye of the fan chamber adjacent the wall 55 to complete the closure.

The converter element used in this embodiment of the invention is the same as that used in the first embodiment and its positioning and removal is the same.

It is believed that the operation of the second embodiment of the invention is clear as it closely resembles that of the first embodiment with the exception that only one instead of two operating positions of the nozzle is available. For on-the-floor cleaning the converter is removed and the nozzle-positioning shaft 71 is manually moved to its outermost position, as illustrated in dotted lines in Figure 8, thereby permitting the wheel-carrying bracket 26 to be spring-pressed to its lowermost position and the nozzle to be forced downwardly into operating position. When the converter element is inserted the machine is intended for off-the-floor cleaning the operator need only to press the rear of the machine downwardly, thereby permitting the shaft 71 to be moved inwardly and under the adjacent arm 27

of the bracket 26, to effect the pivotal movement of the valve 76 into closure position. Thereafter the removal of the pressure upon the rear of the machine causes the arm 27 to contact the slidable shaft 71 under the pressure of spring 29 thereby holding the rear wheels in a raised position and likewise effecting the positioning of the nozzle in an inoperative raised position in which the nozzle lips and the agitator therein cannot contact the surface covering positioned therebelow. The actuation of the fan-driving motor then makes the machine an effective off-the-floor cleaner.

I claim:

1. In a suction cleaner, a body including a nozzle, a fan chamber, and an air passageway therebetween, body-supporting means movable relative thereto to raise and lower said nozzle, resilient means urging said body-supporting means from said body, manually adjustable means of varying heights movable manually between said body and said body-supporting means to limit selectively the movement thereof relative to said body, an air-controlling valve in said air passageway, and means operable upon the movement of said manually adjustable means between certain positions only to actuate said valve.

2. In a suction cleaner, a body including a nozzle, a fan chamber, and an air passageway therebetween, body-supporting means movable relative thereto to raise and lower said nozzle, resilient means urging said body-supporting means from said body, a manually adjustable rigid stop member provided with a plurality of seating surfaces adapted to retain said body-supporting means in a plurality of positions relative to said body to vary the adjustment of said nozzle, an air-controlling valve in said air passageway, and cooperating means on said valve and said rigid stop member to actuate said valve in the movement of said stop member between certain adjustments.

3. In a suction cleaner, a body including a nozzle, a fan chamber, and an air passageway therebetween, body-supporting means movable relative thereto to raise and lower said nozzle, resilient means urging said body-supporting means from said body, a manually adjustable rigid stop member provided with a plurality of seating surfaces adapted to retain said body-supporting means in a plurality of positions relative to said body to vary the adjustment of said nozzle, a pivoted air-controlling valve in said air passageway, a rigid extension carried by said valve and extended outside said passageway, and means carried by said stop member to contact said rigid extension in the movement of said stop member between certain adjustments to pivot said valve.

4. In a suction cleaner, a body including a nozzle, a fan chamber, and an air passageway therebetween, body-supporting means movable relative thereto to raise and lower said nozzle, resilient means urging said body-supporting means from said body, a manually adjustable rigid stop member provided with a plurality of seating surfaces adapted to retain said body-supporting means in a plurality of positions relative to said body to vary the adjustment of said nozzle, a pivoted air-controlling valve in said passageway movable partially thereacross to restrict the flow of air through a part only of said air passageway, spring means urging said valve to one position, a rigid extension on said valve, and rigid means carried by said stop member arranged to contact said rigid extension in the movement of said stop member between certain adjustments to pivot said valve against the force of said spring.

5. In a suction cleaner, a body having a converter port and including a nozzle, a fan chamber, and an air passageway between said nozzle and fan chamber divided longitudinally into two parts, one of said parts being adapted to receive and seat a converter inserted through said port, body-supporting means movable relative to said body to raise and lower said nozzle, resilient means urging said body-supporting means relative to said body, manually adjustable means to limit the movement of said supporting means relative to said body, a valve in said air passageway arranged to move into obstructing position relative to the other of said parts of said air passageway, and means actuated by said manually adjustable means to operate said valve.

6. The structure defined by the preceding claim characterized in that said air passageway is divided by a wall extended between said nozzle and said fan chamber which is positioned as to be contacted by said valve in one of its positions and by a converter element inserted through said port.

7. In a suction cleaner, a body having a nozzle, a fan chamber, and an air passageway between said nozzle and fan chamber, a drive shaft extended through said fan chamber into said passageway, a rotary agitator in said nozzle, a power-transmitting belt extending through said passageway and connecting said shaft to said agitator, means dividing said passageway into two parts through the first of which said belt passes, manually operable valve means to close the first part of said passageway, and a port in said body positioned as to receive a converter element inserted into sealing relationship with the second part of said passageway.

8. In a suction cleaner, a body having a nozzle, a fan chamber, and an air passageway between said nozzle and fan chamber, a drive shaft extended through said fan chamber into said passageway, a rotary agitator in said nozzle, a power-transmitting belt extending through said passageway and connecting said shaft to said agitator, means dividing said passageway into two parts through the first of which said belt passes, manually operable valve means to close the first part of said passageway, a port in said body positioned as to receive a converter element inserted into sealing relationship with the second part of said passageway, and guide means to guide said converter element into said sealing relationship comprising a spring-pressed valve normally closing said port and the front of said fan chamber.

9. In a suction cleaner, a body having a nozzle, a fan chamber, and an air passageway between said nozzle and fan chamber, a drive shaft extended through said fan chamber into said passageway, a rotary agitator in said nozzle, a power-transmitting belt extending through said passageway and connecting said shaft to said agitator, a dividing wall in said passageway extended along one side of said belt, and around said drive shaft, manually operable valve means cooperating with said wall to close said passageway on one side of said belt, and a port in said body positioned as to receive a converter element inserted into sealing relationship with that part of said passageway upon the opposite side of said belt.

10. In a suction cleaner, a body including a nozzle, a fan chamber, and an air passageway

therebetween, body-supporting means movable relative thereto to raise and lower said nozzle, resilient means urging said body-supporting means from said body, a manually adjustable rigid stop member provided with a plurality of seating surfaces adapted to retain said body-supporting means in a plurality of positions relative to said body to vary the adjustment of said nozzle, a pivoted air-controlling valve in said passageway movable partially thereacross to restrict the flow of air through a part only of said air passageway, spring means urging said valve to one position, and cooperating means on said valve and said stop member to move said valve against the action of said spring.

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