Aug. 14, 1956 G. A. BRACE 2,758,329

SUCTION CLEANER AND CONVERTER FACILITY THEREFOR

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Fig. 5.

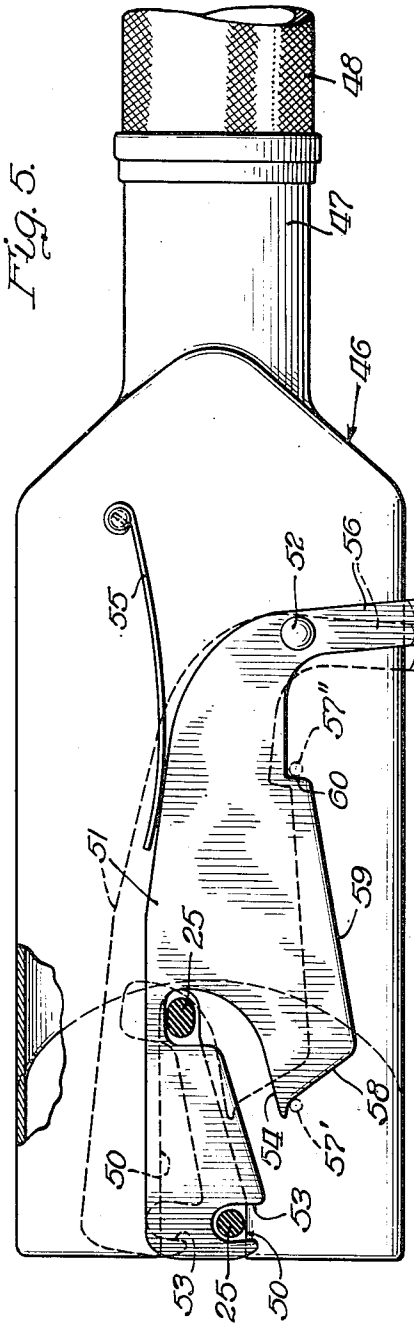
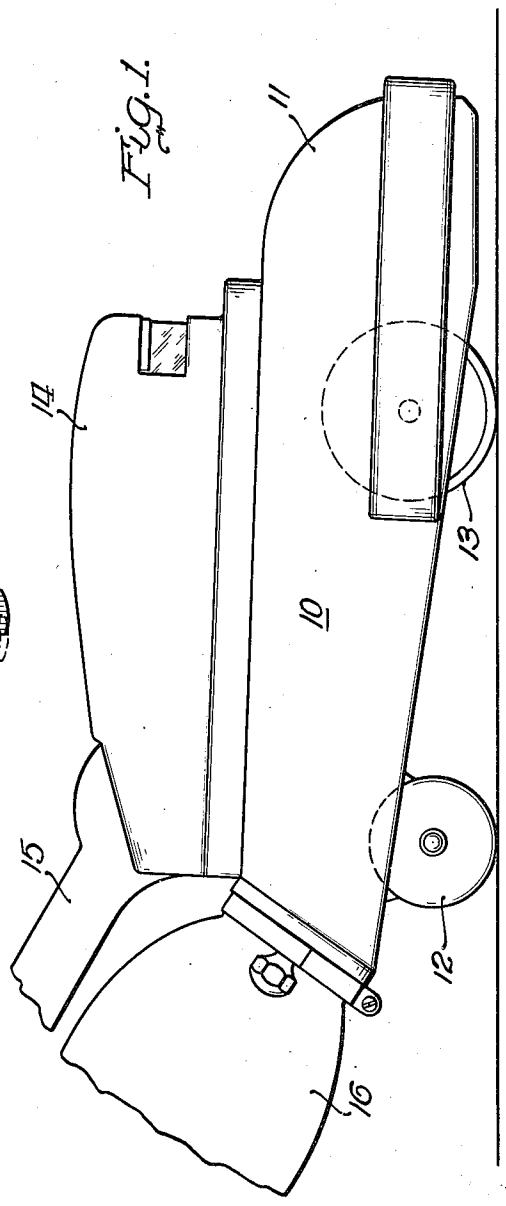


Fig. 1.



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SUCTION CLEANER AND CONVERTER FACILITY THEREFOR

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Fig. 2.

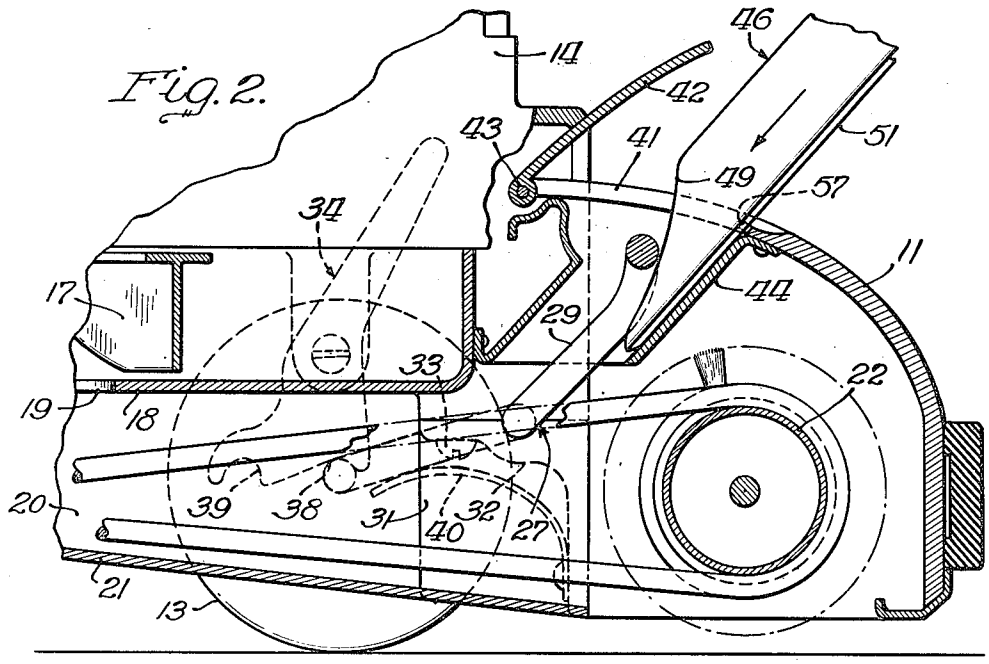
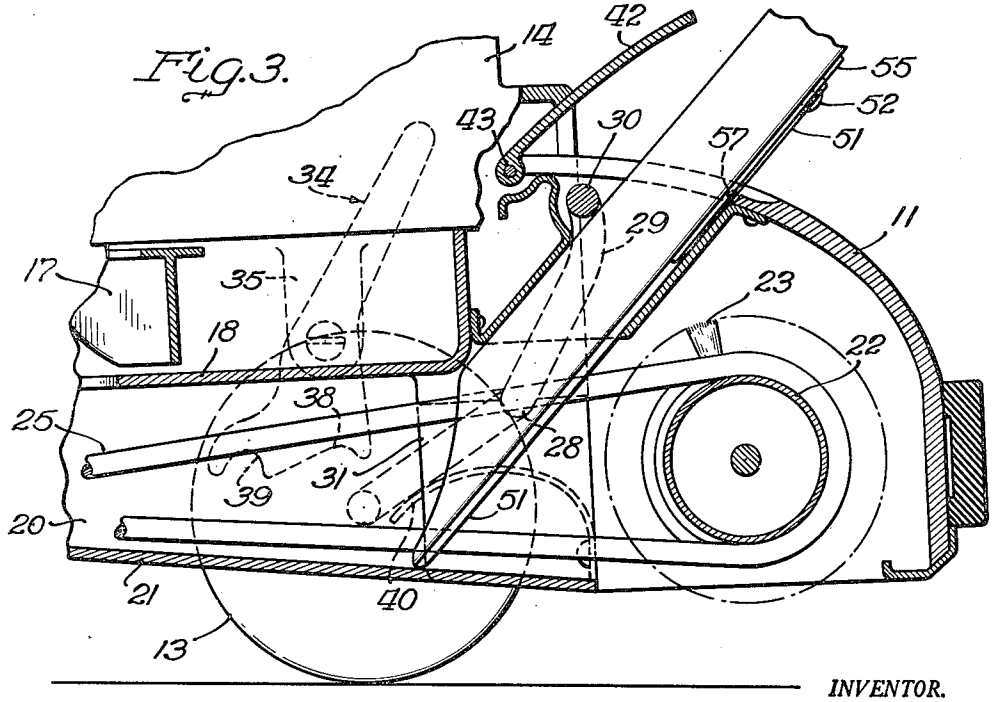


Fig. 3.



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SUCTION CLEANER AND CONVERTER FACILITY THEREFOR

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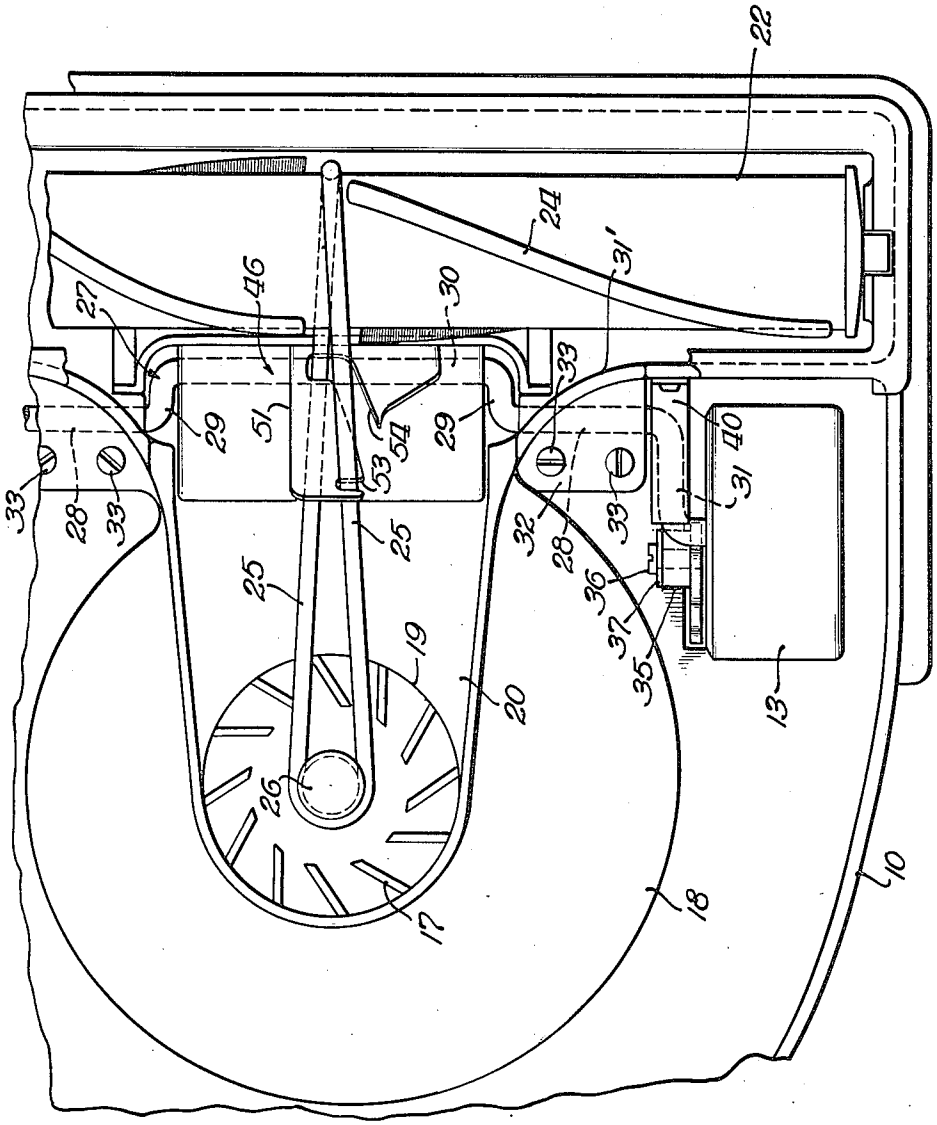

Fig. 4.

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SUCTION CLEANER AND CONVERTER FACILITY THEREFOR

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Fig. 6.

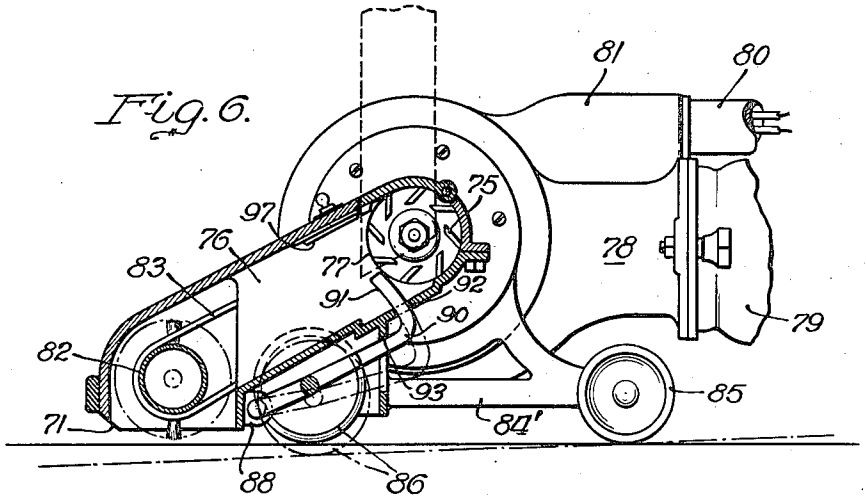
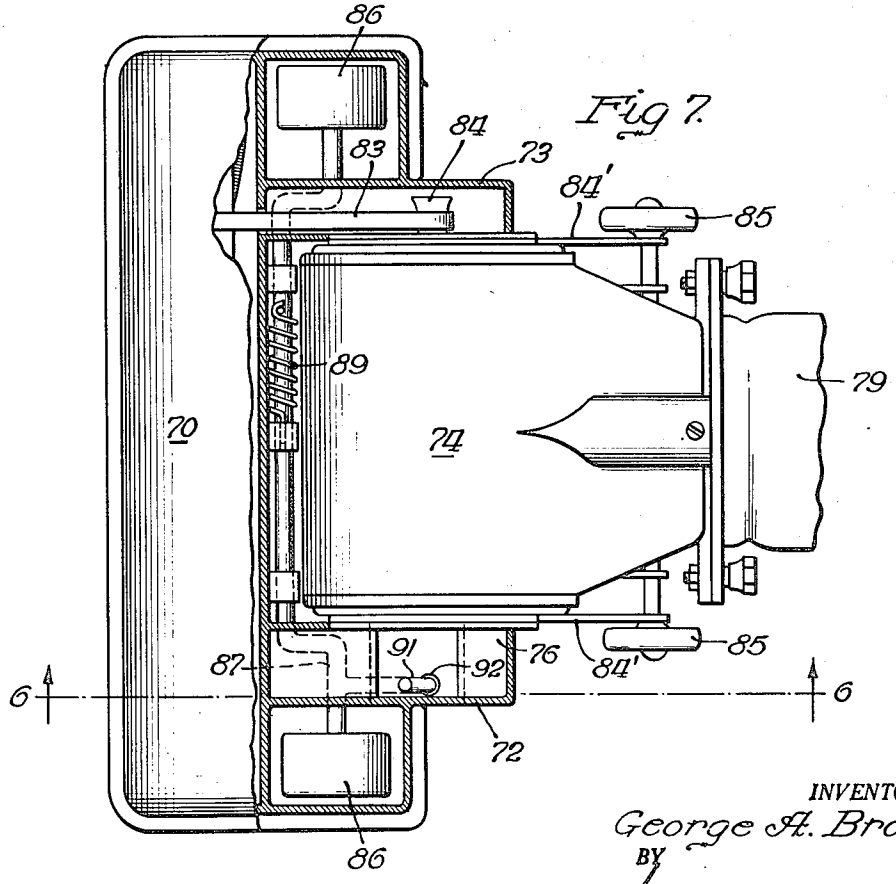


Fig 7.



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SUCTION CLEANER AND CONVERTER FACILITY THEREFOR

Filed Sept. 1, 1951 5 Sheets-Sheet 5

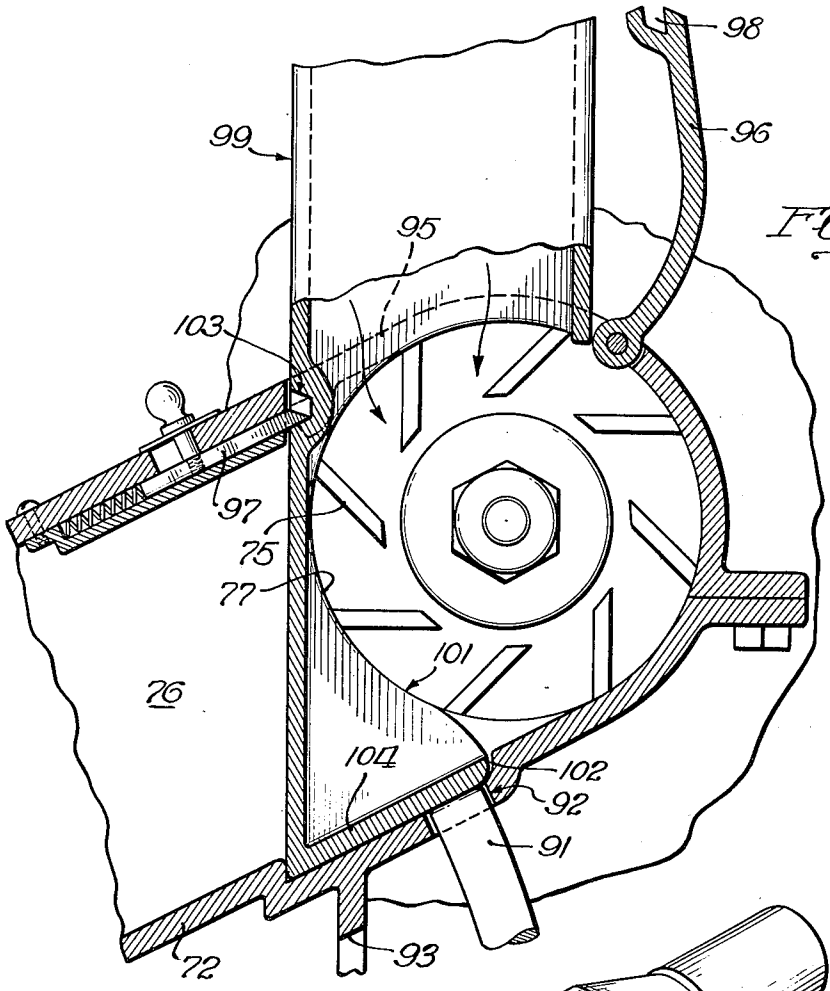

Fig. 8.

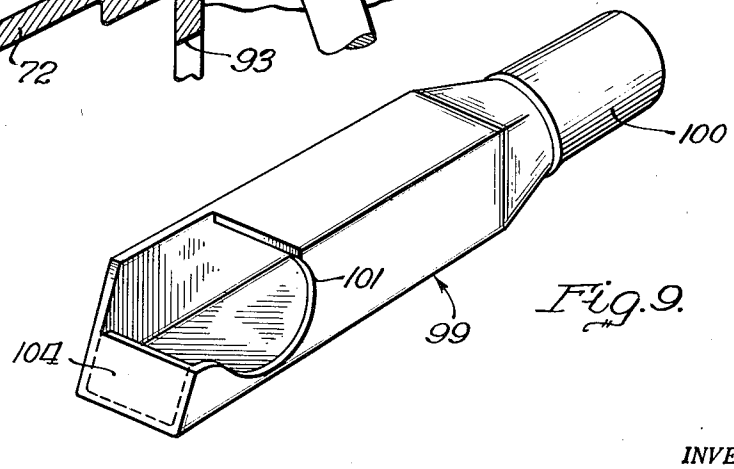

Fig. 9.

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2,758,329

SUCTION CLEANER AND CONVERTER FACILITY THEREFOR

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Application September 1, 1951, Serial No. 244,791

12 Claims. (Cl. 15—333)

This invention relates to suction cleaners and more particularly to new and improved constructions adapted for conversion between on-the-floor and off-the-floor operation with greater facility, convenience and efficiency.

The present invention has particular utility when employed on the modern floor type cleaner having a power driven agitator in the mouth of the suction nozzle for beating the carpet as the surface litter and dirt are picked up. During off-the-floor cleaning, the operation of the agitator is likely to damage the carpet unless the proper precautions are taken. In general, prevalent precautionary measures fall within one of two categories, namely, those in which the agitator is elevated and supported appreciably above the carpet, or those in which the agitator drive is disconnected. However, the constructions of both categories heretofore proposed to protect the carpet are subject to numerous disadvantages.

Since this invention falls within the scope of the first mentioned category of protective expedients, namely, to elevating the agitator, the more serious shortcomings of prior devices of this type will be referred to briefly. For example, certain prior constructions require the operator to perform a sequence of operations in order to convert the cleaner to off-the-floor operation necessitating detailed training of the operator and requiring more skill and mechanical aptitude than is possessed by many housewives. Others impose limitations on the designer and require the converter tool to be inserted from certain points access to which is inconvenient and awkward. Another disadvantage is the complexity and high cost of prior conversion devices.

The present invention provides an unusually simple and effective construction entirely overcoming the shortcomings of those heretofore known. Thus, in the present novel design the converter tool is inserted downwardly through an opening in the top of the suction nozzle and this coupling movement is utilized to elevate and lock the agitator in a raised position entirely removed from contact with the carpet. The simultaneous upward movement of the cleaner obtained in response to the downward insertion movement of the converter is achieved by translating the downward movement into a cleaner lifting force through a simple lever supported on the cleaner carriage.

Accordingly, it is an object of this invention to provide a novel suction cleaner having simple, more convenient, less costly and highly effective means for converting the same between on-the-floor and off-the-floor cleaning.

Another object is to provide a new suction cleaner construction by which downward insertion of the converter tool operates simultaneously to elevate the suction nozzle appreciably above the carpet and to hold it in this position so long as the converter is in place.

A further object is to provide a novel converter tool designed to straddle the runs of the agitator belt and having a slot closing valve thereon which cooperates with the cleaner body in a unique manner to lock the converter in place and the valve closed so long as the converter is in assembled position.

Yet another object is the provision of a cleaner with a converter passage opening upwardly through the top of the suction passageway and having associated therewith means positioned in the path of the converter tool for elevating the suction nozzle. More specifically, it is an object of the invention to so mount the nozzle raising means that it pivots about the wheeled support for the cleaner rather than upon the cleaner body proper.

Various other objects and advantages of the invention wil become apparent from the following detailed description of illustrative embodiments of the invention and the accompanying drawings in which:

Figure 1 is a side elevational view of a floor cleaner incorporating the invention;

Figure 2 is a vertical sectional view through the suction nozzle showing the converter tool being inserted through the converter passage but before it has acted to lift the suction nozzle;

Figure 3 is a view similar to Figure 2 but showing the converter fully inserted and the nozzle in raised position completely out of operating relation with respect to the carpet;

Figure 4 is a bottom view of Figure 3 showing the converter in place and the converter valve in closed position;

Figure 5 is a bottom view of the converter tool showing constructional details;

Figure 6 is a vertical sectional view of a second embodiment of the invention taken along lines 6—6 on Figure 7;

Figure 7 is a top plan view of the cleaner shown in Figure 6 with certain parts broken away to show the interior construction;

Figure 8 is a view similar to Figure 6 showing the converter tool fully inserted; and

Figure 9 is a perspective view of the converter tool employed in the second embodiment.

The first embodiment is shown as incorporated in a suction cleaner having a main body 10 provided with a suction nozzle 11 extending across its forward end and supported upon a pair of rear wheels 12 and a pair of front carrier wheels 13. A vertical axis motor-fan unit, not shown in detail, will be understood to be supported centrally of the top side of the cleaner body and to be enclosed by an appearance hood 14. The usual propelling handle 15 is pivoted to the rear end of the body at a point overlying the air discharge passageway and the usual filter bag 16. As will be better understood by reference to Figures 2 and 3, the suction fan 17 is located in a fan chamber 18 having an inlet eye 19. This eye is in communication with the suction nozzle through a rearwardly extending suction air passageway 20 the bottom wall 21 of which is removable in accordance with customary practice.

A rotary agitator 22 is rotatably mounted just inside the mouth of the suction passageway and is provided with the usual carpet beating elements such as the rows of bristles 23, and rigid beater bars 24. The agitator is driven by a belt 25 encircling the agitator and connected to a pulley 26 on the lower end of the motor shaft.

The carrier wheels 13 are mounted on the opposite ends of an axle shaft generally indicated at 27. This shaft extends transversely of the cleaner body and is bent as illustrated in Figures 2 to 4 to form a pair of bell cranks which are pivoted to the cleaner body intermediate their ends as at 28. One pair of bell crank arms 29, 29 extend upwardly into the top portion of the suction nozzle and their ends are interconnected by the central portion 30 of the axle. The other pair of bell crank

arms 31, 31 extend downwardly from the bearing portion 28 and support the carrier wheels 13, 13.

As will be evident from the drawings, shaft 27 extends through the upper, forward corner of suction air passageway 20. For convenience in constructing and assembling the cleaner, the vertical side walls of the suction air passage adjacent its juncture with the rear wall of the suction nozzle are cast separately and include a curved vertical wall 31 and a horizontal bearing cap portion 32 which underlies bearing portion 28, 28 of the shaft 27. These elements are held in position by a pair of screws 33, 33. It will therefore be clear that the central inverted U-shaped portion of shaft 27 formed by arms 29, 29 and central portion 30 is positioned within the suction nozzle. As shown in Figure 4, arms 29, 29 are located to one side of the side walls of suction passageway 20 so as not to interfere with the air flow nor with the insertion of the converter tool as will be more fully described below.

To provide for adjustment of the suction nozzle to carpets of different thicknesses there is provided a manual control lever 34 which is supported on stud 35 projecting downwardly from the underside of the cleaner body. The lever is pivotally connected to this stud by a screw 36 and a friction spring washer 37. The lower end of the lever is provided with two or more notches 38, 39 located at different radial distances from the pivot screw. The upper or handle end 40 of the control lever projects upwardly through an opening in the cleaner body so as to be operable from the top side of the cleaner.

When lever 34 is in the position shown in Figures 2 and 3, notch 38 is in position to abut shaft 27 at a point beside one of the supporting wheels 13, and thereby prevents further clockwise rotation of the shaft. In other words, notch 38 adjusts the nozzle to its lower operating position for handling carpets of average thickness. If it is desired to operate the cleaner on thick carpets, the adjusting lever is pivoted rearwardly so that notch 39 overlies the wheel axle to hold the nozzle in a somewhat higher position for operation on such carpets. The friction washer 37 retains the control lever in a selected operating position even though the shaft 27 is entirely removed from notches 38 and 39.

In order to prevent shaft 27 from rotating counterclockwise about bearing pivot 28 when the cleaner is lifted from the floor, there is provided a light leaf spring 40 one end of which is secured to the back wall of the suction nozzle and the other end bears against the underside of arm 31 of the axle shaft. This spring accordingly urges the shaft to rotate counterclockwise into firm engagement with notch 38 or 39 of the control lever.

The conversion facilities will now be described, reference being invited to Figures 2, 3 and 4. The converter port 41 is located in the top wall of the suction nozzle and is normally closed by a cover plate 42 having a hinged connection 43 with the cleaner body. A converter receiving passage is provided by a tubular member 44 extending downwardly from port 41 at an angle. The upper end of member 44 is secured to the top wall of the nozzle while the lower end opens directly into the suction passageway at a point between the forward end of the fan chamber and the agitator. The central U-shaped portion of the wheel axle extends upwardly into this passageway and accordingly lies in the path of the converter tool as it is inserted into passageway 44. The upper, rear wall portion of member 44 is shaped to receive horizontal portion 30 of the wheel axle when this portion is pivoted counter-clockwise by the converter tool, as is clearly shown in Figure 3.

The converter tool itself is illustrated in Figure 5 and comprises a tubular sheet metal member 46 having a socket 47 at one end forming a coupling for the usual flexible hose 48. Its opposite end is of rectangular shape and of a size to be readily received by converter receiving member 44. The discharge end of the converter tool is open and shaped as illustrated in Figures 2, 3 and 5. Thus, as appears most clearly from Figure 2, the lower ends of the opposite sides of the converter tool are shaped to provide cam surfaces 49 which engage the underside of horizontal portion 30 of the wheel shaft as the converter enters member 44. Further downward movement of the converter rotates the axle counter-clockwise about the axis of carrier wheels 13. In so doing, all other portions of the shaft, including pivot portion 28, rotate counter-clockwise and carry the forward end of the body upwardly about the rear wheels thereby raising the suction nozzle completely off the carpet to the position illustrated in Figure 3. The front wall of the converter is then in contact with cover plate 21 of the suction air passageway. The sides of the nozzle lie flush against the sides of the suction passageway while the top wall rests against the lower, forward corner of the fan chamber thereby cutting off all air flow from the suction nozzle and confining the flow to the converter tool.

In order to avoid having to disconnect the agitator drive when converting the cleaner to dusting tool use, provision is made for straddling the runs of the agitator belt and for sealing off the required slot in the converter tool automatically. To this end, the front wall of the converter tool is provided with a belt receiving slot 50. The portions of this slot not occupied by the runs of the belt are closed by a unitary valve member 51 pivoted to the forward side of the tool by a rivet 52. This valve is provided with a lower notch 53 and an upper notch 54 of the configuration illustrated for receiving the runs of the belt and closing off the remainder of slot 50. The valve is normally urged toward and held in closed position by light spring 55 secured to the converter tool. The valve is also provided with a manual lever 56 terminating at one side of the tool in a convenient position to be grasped by the operator when it is desired to unlatch and remove the converter from the cleaner.

It will also be noted that one side of the valve member is provided with a pair of cam surfaces terminating in a notch just below operating lever 56. These cam surfaces serve to open the valve and hold it open while the tool is being inserted. This is accomplished by means of a pin 57 projecting inwardly from the front peripheral edge of converter port 41. The position of this pin when the converter valve first contacts it during insertion is indicated by the dotted line showing of the pin at 57′ in Figure 5. In other words, soon after the insertion of the converter in passage 44, pin 57 will engage cam surface 58 of the valve member and pivot it clockwise to the dotted line position illustrated in Figure 5, and into a position permitting the runs of the belt to be received by slot 50 of the tool. Due to design of cam 58, opening of the valve occurs very quickly. After the valve is open it is held open by the engagement of pin 57 with cam surface 59 of the valve member. By the time the converter has been fully inserted, pin 57 will be in the dotted position indicated by 57″ in Figure 5 wherein it is opposite locking notch 60 of the valve member. So long as pin 57 is engaged in notch 60, the converter is locked firmly in place and cannot be removed until control lever 56 is manually rotated clockwise in opposition to spring 55.

Attention is also invited to Figure 3 from which it will be observed that portion 30 of the shaft 27 rests against the rear, top wall of the converter tool thereby locking the nozzle in raised position so long as the converter is in place.

Reconversion to on-the-floor cleaning is readily accomplished by unlatching the converter as described immediately above and withdrawing the tool. As the lower end passes upwardly beyond portion 30 of the shaft, the shaft rotates clockwise about the axis of wheels 13 until the cleaner comes to rest in the previously adjusted position of the nozzle wherein the shaft is received in either notch 38 or 39 of nozzle adjustment lever 34. As soon as con-

verter cover 42 is closed, the cleaner is ready for continued on-the-floor operation.

Second embodiment

A somewhat simplified version of the invention is illustrated in Figures 6 to 9 of the drawings. According to this version, it is unnecessary to extend the carrier wheel shaft through the suction air passageway, nor is it necessary to make provision on the converter tool for sealing off the belt drive to the agitator. This is accomplished by resort to a cleaner having a horizontally arranged motor-fan unit of a type well known in the prior art. The cleaner body 70 has a downwardly opening suction nozzle 71 across its forward end which is in communication with two rearwardly and upwardly extending housings 72 and 73. The generally cylindrical motor-fan unit 74 is provided with bearings of well known construction at its opposite ends which are rotatably supported on the facing sides of housings 72 and 73, as clearly appears from Figure 7.

As viewed in Figure 7, the electric driving motor is located at the top end of the casing while suction fan 75 opens into suction air passageway 76 provided by housing 72 through fan eye 77. The fan discharges into exhaust air passageway 78 which opens into a detachable filter bag 79. The propelling handle 80 is connected to a socket 81 formed on the upper side of exhaust passageway 78. It is therefore to be understood that the entire motor-fan unit, propelling handle and filter bag pivot as a unit on an axis coinciding with the axis of the motor-fan unit.

A rotary agitator 82 is mounted in the suction nozzle and is connected by a driving belt 83 to the motor driven pulley 84. This pulley and the driving belt are located in housing 73.

Bracket members 84 are rigidly secured to body 70 of the cleaner and support rear wheels 85. The front carrier wheels 86 are mounted on the outer ends of U-shaped axle 87 pivotally supported in bearings 88 carried on the rear lip of the suction nozzle. A light torsion spring 89 is so arranged as to urge the axle and wheels to rotate counter-clockwise toward the cleaner body.

An L-shaped member 90 has its lower end welded or otherwise rigidly secured to axle 87. Its upper end 91 extends upwardly through an opening 92 in the bottom of the suction air passageway 76 into the path of the converter tool. Normally, spring 89 and the weight of the cleaner causes the axle and arm 90 to rotate counter-clockwise against stop 93 wherein the nozzle is properly positioned for on-the-floor cleaning. It will of course be understood that, if desired, a nozzle adjustment control may be employed in lieu of stop 93, as for example the type described in connection with the first embodiment.

Reference will now be had to Figures 8 and 9 for a description of the converter facilities. A converter port 95 located in the top wall of housing 72 is normally closed by a hinged cover 96 spring biased to open position by a torsion spring encircling the cover hinge but not shown in the drawings. This cover is normally held closed by a latch mechanism 97 having an end engageable in notch 98 of the cover.

The converter tool illustrated in Figure 9 comprises a sheet metal tubular member 99 having a coupling 100 for connection to the flexible hose. The opposite end is cut away as indicated at 101 to register with fan eye 77 and to cut off flow through the suction nozzle when the tool is in place. The lower end of the tool is receivable in a recess 102 on the lower end of the suction passageway. The converter tool is latched in position by the engagement of latch device 97 in notch 103 on the forward wall of the converter tool. As clearly shown in Figures 8 and 9, the lower end 104 of the converter tool

overlies the upper end of member 91 of the L-shaped extension connected to the carrier wheel axle. It follows therefore that as the converter tool is inserted downwardly through converter port 95, wall 104 of the tool depresses member 91 and, in so doing, rotates the carrier wheel axle 87 clockwise about the axis of carrier wheels 86, thereby elevating the suction nozzle to a position completely above the carpet, as indicated by the dot and dash floor line in Figure 6.

The operation of the second embodiment will be obvious from the detailed description of the first embodiment and the foregoing structural description. It will also be appreciated that, since the agitator driving belt is located in a passageway separate from the suction air passageway, there is no need for providing a belt receiving slot in the converter tool or any valve means for closing the slot.

Moreover, conversion to off-the-floor cleaning is accomplished very simply. All that is necessary is to unlatch cover 96 and insert the converter tool downwardly through the converter port. As the converter is inserted, the bottom wall will engage the nozzle raising member. Further downward movement of the tool lifts the nozzle until latch means 97 engages notch 103 of the tool and locks the converter in place. Locking of the converter also locks the nozzle in raised position and holds it there so long as the converter is in place. Reconversion is accomplished by releasing latch 97, withdrawing the converter, and allowing cover 96 to close under the influence of the spring located in its hinge.

While I have shown but two embodiments of my invention it is to be understood that these embodiments are to be taken as illustrative only and not in a limiting sense. I do not wish to be limited to the particular structure shown and described but to include all equivalent variations thereof except as limited by the scope of the claims.

I claim:

1. A suction cleaner comprising, a main body provided with a suction nozzle having a rotary agitator therein, a motor driven suction fan on said body rearwardly of said nozzle, driving means extending between said motor and said agitator, a suction passage in said body extending between said fan and said nozzle, wheel means supporting said body including a pair of wheels at all times supporting said body and movable vertically toward and away from said body to adjust the height of said nozzle with respect to the floor, means for converting said cleaner from on-the-floor to off-the-floor cleaning including a converter receiving port in the upper side of said suction passage, a cover for said port when said cleaner is used for on-the-floor cleaning, and means connected with said movable wheels and extending into the path of a converter tool as it is inserted downwardly through said converter port and movable by the downward inserting movement of a converter tool to elevate said nozzle out of cleaning relation to a carpet, the arrangement being such that the resistance to the insertion movement of said tool is utilized to elevate said nozzle.

2. The combination with a suction cleaner of the type having a main body, a suction nozzle thereon carrying a rotary agitator, a motor driven suction fan rearwardly of said nozzle, a belt between said motor and agitator to drive the latter, a suction passage leading from said nozzle to said fan, a converter port in the top of said passage for receiving a converter tool for off-the-floor cleaning, of means for supporting said nozzle at selectively different carpet cleaning elevations for on-the-floor cleaning and for automatically elevating said nozzle out of cleaning relation to a carpet for off-the-floor cleaning comprising, wheeled means for supporting said cleaner on a carpet, said wheeled means being connected to said body for limited vertical movement toward and away therefrom, manually operable means for adjusting the position of said wheeled means relative to said cleaner body for on-the-floor cleaning, said wheeled means including a lever mov-

ably mounted on said body and fulcrumed on the axis of one of the wheels of said wheeled means and having a portion thereof positioned in the path of a converter tool inserted through said port and movable thereby so that said lever is pivoted about said fulcrum to elevate said suction nozzle as the converter tool is moved downwardly into air-tight seating engagement with said converter port.

3. The combination defined in claim 2 wherein part of said lever is positioned outside said suction passage and part is postioned within said passage at a point underlying said converter port.

4. The combination defined in claim 3 including said manually operable means supported on said cleaner body and having a plurality of stops movable into the path of said wheeled means to adjust the operating elevation of said nozzle for on-the-floor cleaning, and means for frictionally holding said manually operable means in a preselected position while said nozzle is elevated for off-the-floor cleaning whereby said nozzle is returned to the same adjusted position occupied before being converted to off-the-floor operation.

5. The combination defined in claim 2 wherein said lever comprises a double crank-shaped axle for a pair of cleaner supporting wheels and wherein said axle has a portion thereof extending into said suction passage from the exterior thereof to a point located in the path of a converter tool as it is inserted downwardly through said port, said axle being shiftable about the axis of said pair of wheels by the insertion of the converter tool to elevate said suction nozzle.

6. The combination with a suction cleaner of the type having a main body provided with a suction nozzle across the forward end thereof, a rotary agitator mounted in said nozzle, a motor driven suction fan on said body rearward of said nozzle, a suction air passage extending rearwardly from said nozzle to said suction fan, a belt positioned in said passage and extending between said motor and agitator to drive the latter, of means for converting said cleaner to off-the-floor operation and for simultaneously elevating said nozzle and agitator appreciably above the carpet comprising, a converter receiving port opening through the top of said nozzle forwardly of said suction fan, a plurality of vertically adjustable wheels at all times supporting said cleaner and including movable lever means fulcrumed on the axis of certain of said wheels and having a pivotal connection with said cleaner body, a portion of said lever means being positioned in the path of a converter tool inserted through said port and movable thereby to elevate said nozzle by using the axis of said certain wheels as a fulcrum, and a closure for closing said port while said cleaner is being used for on-the-floor cleaning.

7. The combination defined in claim 6 wherein said lever means includes an axle extending crosswise of said cleaner rearward of said nozzle, said wheels being journaled on the opposite ends of said axle, said axle having portions thereof offset from the axes of said wheels and journaled in said cleaner body on the opposite sides of said suction air passage.

8. The combination defined in claim 6 including a converter tool having open ended slot means at the lower end thereof to receive the runs of said agitator driving belt as said tool is inserted downwardly through said converter port, valve means mounted on said tool closing said slot means except for openings to receive the runs of said belt, said valve means being normally held closed by a spring, co-operating abutment means on said cleaner and valve means operable to open said valve means as said converter tool enters said converter port and to hold said valve means open until said tool is seated whereupon said valve spring closes said valve means about the runs of said belt, said abutment means cooperating to lock said converter tool in place in said cleaner and to hold said nozzle in the elevated position thereof.

9. The combination defined in claim 6 including a converter tool having open ended slot means at the lower end thereof to receive the runs of said agitator belt as said tool is inserted downwardly through said converter port, a spring-biased valve member pivotally mounted on said tool normally closing said slot means except for openings to receive said belt runs, an abutment extending from the edge of said port and engageable with a cammed edge on said valve member formed to open said valve as said converter is inserted through said port and to hold the valve open until the converter tool is seated in said port, and a recess in said valve member which locks behind said abutment to hold said valve closed and said converter in place on said cleaner and said nozzle in said elevated position during off-the-floor operation thereof.

10. The combination defined in claim 6 including a converter tool the lower end of which is cut off on the bias to provide a cam surface for engagement with the said portion of said lever means positioned in the path of the tool as it is inserted downwardly through said port whereby said lever means is pivoted about said fulcrum as the converter tool is inserted thereby elevating said nozzle for off-the-floor cleaning.

11. The combination with a suction cleaner having a main body provided with a suction nozzle, a rotary agitator therein, a motor-driven suction fan on said body, said body having a suction air passage extending between said nozzle and said fan, a belt extending through said passage between said motor and agitator to drive the latter, said passage having a converter receiving port therein, vertically adjustable wheel means supporting the forward end of said cleaner, a converter tool for converting said cleaner to off-the-floor operation, said tool being insertable through said port and having slot means to receive the runs of said agitator driving belt as the tool is inserted transversely of said suction air passage, valve means on said tool for closing the portions of said slot means not occupied by the belt runs, lever means pivotally mounted on said body and fulcrumed on the axis of the wheels of said wheel means and extending into the path of said tool as the latter is inserted through said port for raising said nozzle out of cleaning relation to the floor, and interengaging means on said cleaner and on said valve means for holding said converter tool in a position such that said lever means is operative to hold the suction nozzle out of cleaning relation to the floor, said interengaging means also being operative to hold said converter tool seated within said converter port and in a position to cut off substantially all air flow through the suction nozzle.

12. In combination with a floor type suction cleaner readily convertible between on-the-floor and off-the-floor operation comprising, a main body having a suction air passage, a power-driven suction unit on said body opening into said air passage, a downwardly facing suction nozzle in communication with said passage, a rotary agitator in said nozzle, belt driving means therefor connected to said power unit and extending through said suction air passage, means on said cleaner supporting a pair of vertically adjustable wheels, a converter port opening into said air passage through the top wall thereof, a converter tool insertable downwardly through said port into said passage and having slot means to receive said belt for converting said cleaner to off-the-floor operation, valve means on said tool for closing the portions of said slot means not occupied by said belt as the tool is inserted across said passage, means engageable by said tool as the same is inserted through said port for elevating said nozzle on said wheels to a non-cleaning position above the floor, and means on said cleaner engageable with the valve means on said tool for holding the latter seated in said suction air passage wherein the tool is effective in cooperation with said nozzle elevating means to hold said nozzle out of cleaning relation to the floor.

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