May 12, 1953 H. B. WHITE 2,637,874

CONVERTIBLE SUCTION CLEANER WITH AGITATOR DRIVE DISENGAGING MEANS

Filed Sept. 8, 1949 4 Sheets-Sheet 1

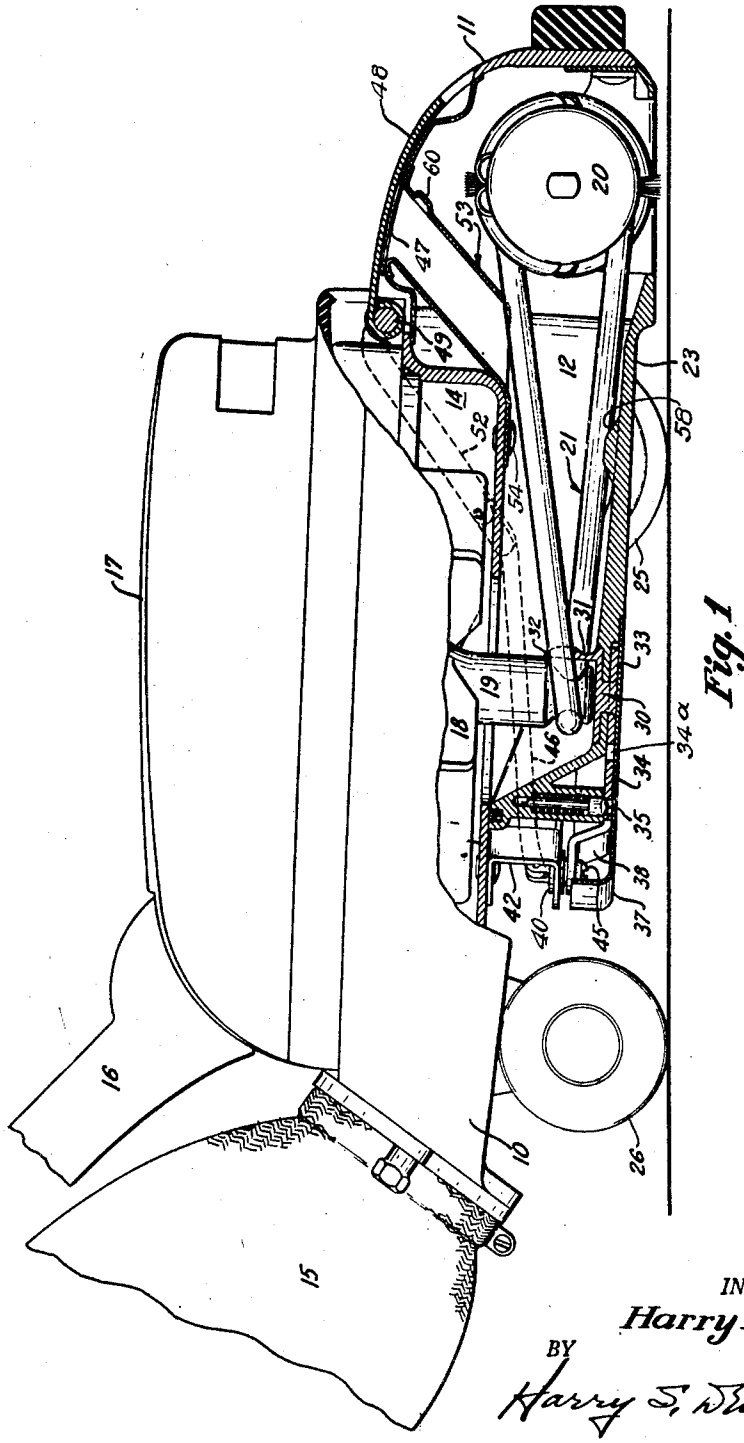


Fig. 1

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Filed Sept. 8, 1949 4 Sheets-Sheet 2

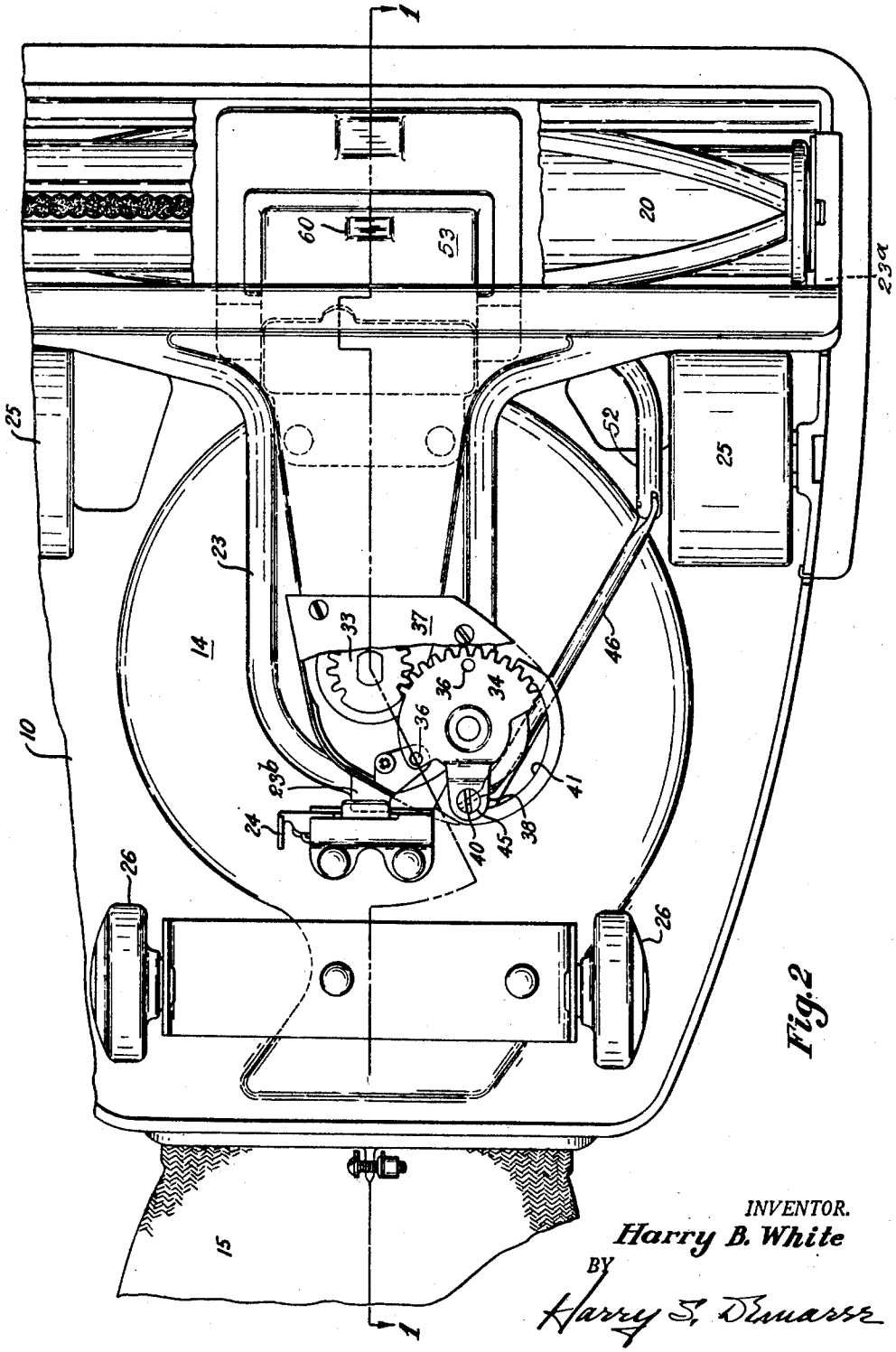


Fig. 2

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CONVERTIBLE SUCTION CLEANER WITH AGITATOR DRIVE DISENGAGING MEANS

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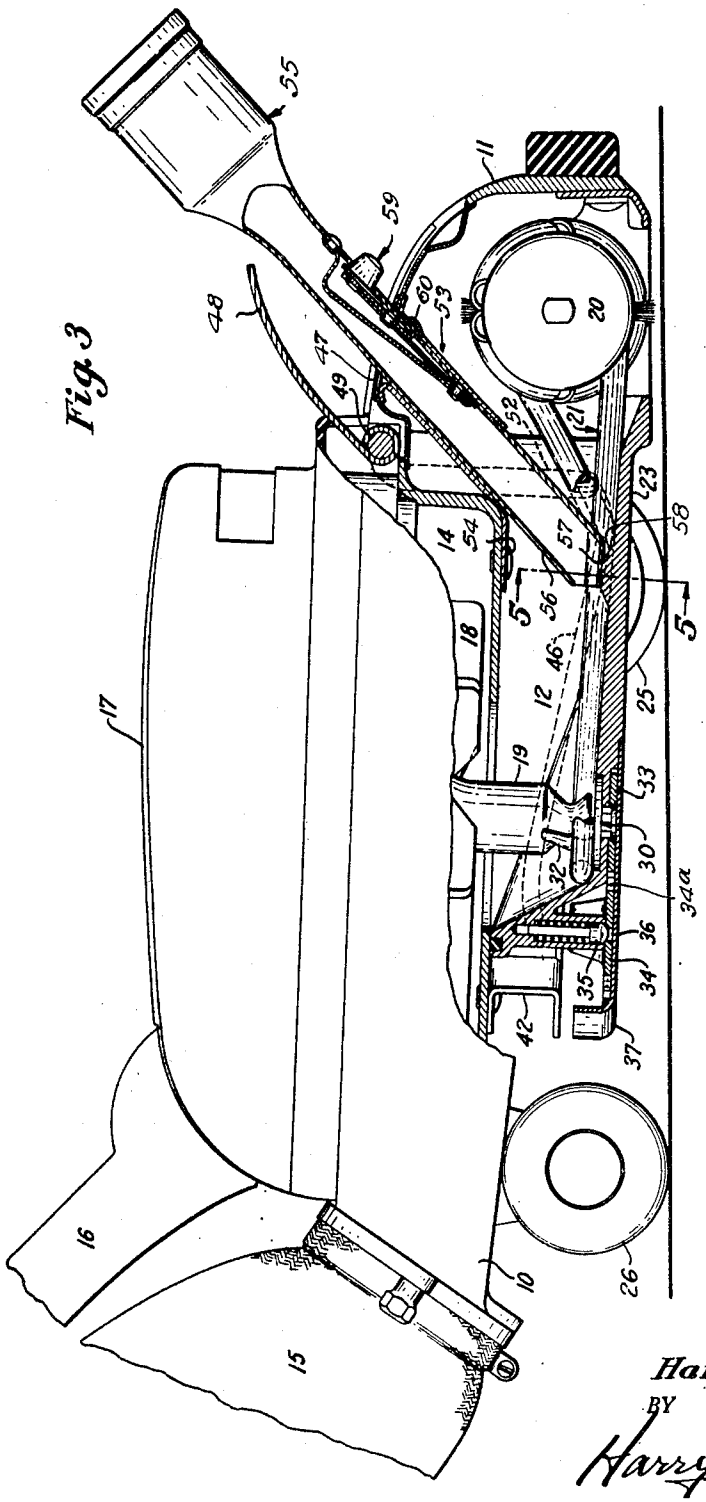


Fig. 3

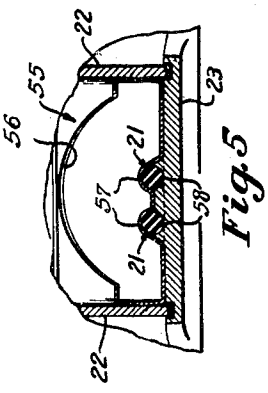


Fig. 5

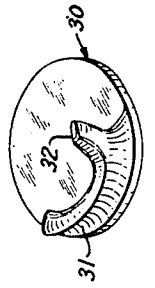


Fig. 4

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CONVERTIBLE SUCTION CLEANER WITH AGITATOR DRIVE DISENGAGING MEANS

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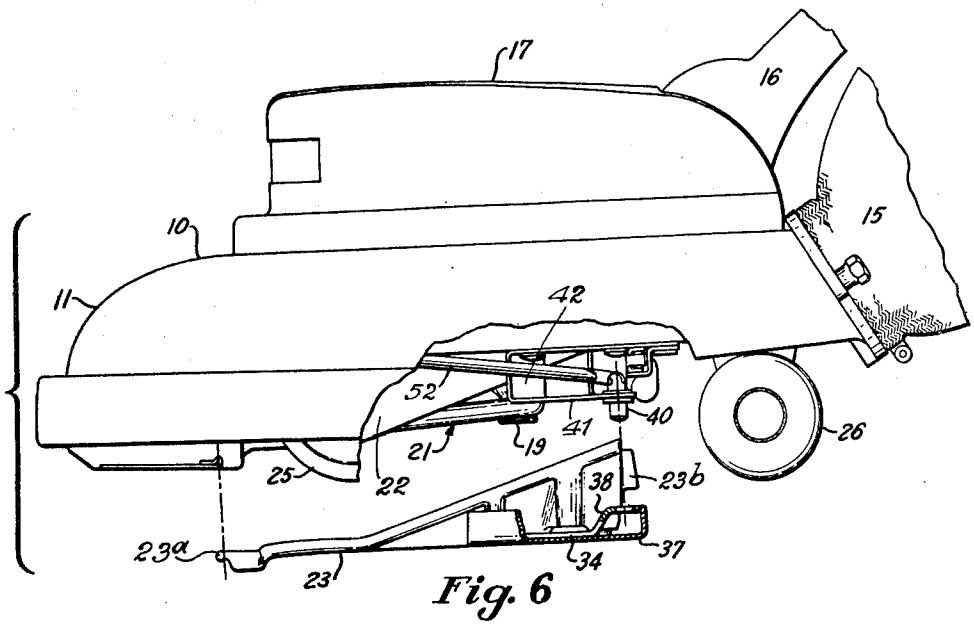


Fig. 6

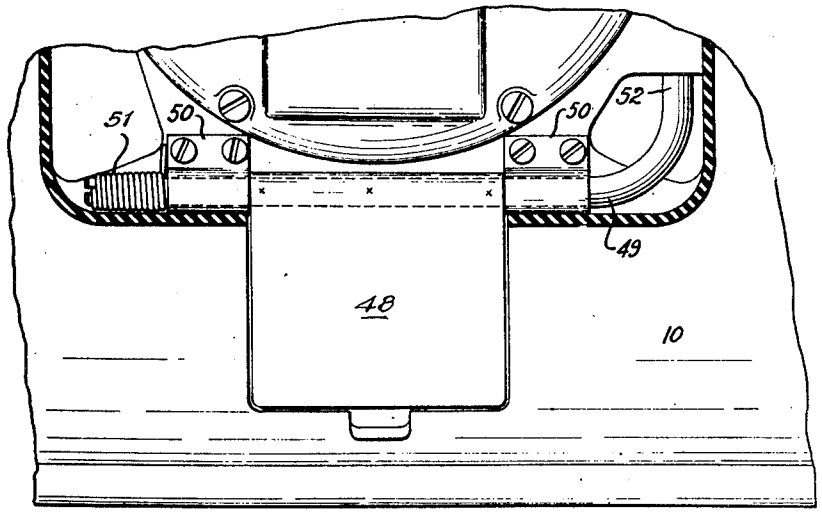


Fig. 7

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Patented May 12, 1953

2,637,874

UNITED STATES PATENT OFFICE

2,637,874

CONVERTIBLE SUCTION CLEANER WITH AGITATOR DRIVE DISENGAGING MEANS

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Application September 8, 1949, Serial No. 114,470

22 Claims. (Cl. 15—332)

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The present invention relates to suction cleaners and more particularly to a new and improved mechanism for converting such a cleaner to dusting tool operation.

Numerous attempts have been made to construct a satisfactory suction cleaner having effective mechanism for converting it to dusting tool operation particularly with respect to cleaners having belt driven agitators. Desirable but heretofore unattained objectives include a simple, low-cost, easily operated, conveniently accessible means for converting from the top, forward portion of the cleaner, for disconnecting the agitator drive and for utilizing a portion of the combined belt and suction air passageway as the dusting tool air passageway without appreciable air leakage around the belt and converter tool. Prior constructions designed to meet these rigorous requirements are subject to numerous short-comings and have not enjoyed commercial success.

An object of the present invention is to provide an improved suction cleaner having simple, effective, easily operated and highly efficient conversion mechanism.

Another object of the invention is to provide an improved belt disconnect operable in unison with the converter cover.

A further and important object is an arrangement for converting into a combined suction air and belt passageway while providing an effective, substantially leak-proof seal between the belt, the converter tool and the suction air passage.

Still another object is a unique belt disconnect constructed on a readily removable cover which, when in place, is operably coupled to a remote control conveniently located for access from above the cleaner body.

Yet another object is the provision of a novel converter mechanism operable from the top, forward portion of a cleaner.

Further objects and advantages of the invention will become apparent from the following specification and drawings wherein:

Figure 1 is a side elevation of the cleaner with parts broken away and taken along the line 1—1 of Figure 2, and showing the cleaner arranged for on-the-floor cleaning;

Figure 2 is a bottom view with portions broken away to show the position of parts when the belt is supported on the motor pulley;

Figure 3 is a view showing the position of parts when the converter is attached for off-the-floor cleaning;

Figure 4 is a perspective view of the belt disconnecting element;

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Figure 5 is a view along 5—5 of Figure 3;

Figure 6 is an exploded view of the cleaner with the pulley cover plate removed, and

Figure 7 is a top fragmentary view of the converter port cover construction.

This application is a continuation-in-part of applicant's application for Letters Patent, Serial No. 486,635, filed May 12, 1943, now abandoned.

The embodiment of the invention herein disclosed comprises a suction cleaner having a body 10 provided with a nozzle 11 interiorly connected through a combined belt and suction air passageway 12 with a fan chamber 14 exhausting rearwardly into a filter bag 15. The upper end of bag 15 is attached to a handle 16 pivotally connected to the upper, rear corner of the cleaner body. A hood 17 encloses an electric motor positioned above fan chamber 14 and the lower end of its shaft carries a fan 18 and a pulley 19 located in air passageway 12.

An agitator 20 is rotatably mounted in the nozzle 11 and is driven by a resilient belt 21 extending centrally along passageway 12 to pulley 19. Passageway 12 extends from the nozzle 11 to the fan chamber 14 and comprises generally vertical side walls 22 depending from the cleaner body and a removable bottom plate 23. Plate 23 is provided with lugs 23a at its forward corners which hook over portions of the nozzle mouth and with a lug 23b at its rear end which is engageable with a well known form of clamp 24 to detachably lock the cover plate in place.

The cleaner body is supported on front and rear wheels 25 and 26, respectively, the front wheels having a greater tread area than the rear wheels to maintain the nozzle 11 in proper adjustment with the surface being cleaned in accordance with known nozzle adjustment principles.

The mechanism for converting the cleaner to dusting tool use includes, as major elements, a belt disconnect built into removable cover plate 23, and an operating means therefor supported on the cleaner body and including the converter port cover located on the top side of suction nozzle 11.

The belt disconnect comprises a disk 30 journaled in cover plate 23 opposite the end of and in axial alignment with pulley 19. An upstanding, arcuate, grooved flange 31 is formed on disk 30 and terminates in a guide finger 32 which aids in directing the upper run of belt 21 into groove 31 during removal of the belt from the pulley. Normally, groove 31 and finger 32 are positioned on the forward side of the pulley and out of contact with the runs of the belt. Rigidly se-

cured to disk 30 on the bottom side of cover 23 is a gear wheel 33 which meshes with a driving toothed sector 34 journaled at 34a to cover 23. A spring biased keeper 35 carried on cover 23 cooperates with spaced openings 36 in sector 34 to hold the sector in one or the other of its two stationary positions. An appearance cover 37 encloses the gears and protects them from entry of foreign matter.

The operating mechanism for the belt disconnect comprises a depending bracket 42 secured to the under side of fan chamber 14. Horizontally disposed, arcuately slotted flange 41 of this bracket carries a vertically arranged coupling pin 40. The lower end of pin 40 fits into an opening 45 on arm 38 of sector 34 while its upper end is hinged to a power transmitting link 46. The lower end of pin 40 is conically formed to facilitate its assembly to sector arm 38 during replacement of pulley cover plate 23.

The converter facilities proper will be best understood by reference to Figures 1, 3 and 7. Centrally located on the top side of nozzle 11 immediately forward of the motor hood is a converter opening 47. This opening is normally closed by a cover 48 supported at its rear edge by an L-shaped hinge rod 49 and keeper clips 50. The cover may be welded or otherwise secured to rod 59 so that a torsion spring 51 acting between the rod and the cleaner serves to urge the cover closed against the gasket surrounding port 47. The other end 52 of rod 49 projects downwardly at one side of the fan chamber and is pivotally coupled to the forward end of link 46.

An open ended rectangular casing 53 has its upper end in alignment with converter port 47. Its lower end is in communication with suction air passageway 12 and is secured to the fan casing as by a rivet 54. A rectangular converter tool 55 is formed to fit within casing 53 rather snugly and so that its sides fit against vertical walls 22 of passageway 12 in an airtight manner. The lower, forward face of the converter is cut away at 56 to provide for free flow of air through the converter and into the fan inlet. The lower end of the converter, however, is shaped as indicated at 57 in Figure 5 to receive the upper cross-sectional half of the belt runs and to cooperate with similarly shaped notches 58 in the inner face of cover 23 and the bottom wall of passage 12 to prevent any air flow from nozzle 11 to the fan during conversion. Converter 55 is locked in this airtight position by a spring latch 59 mounted on the converter and engageable with a notch 60 in casing 53. The upper end of the converter is, of course, adapted to receive the usual flexible hose and dusting tool accessories.

Operation

During use of the cleaner for on-the-floor operation, the parts are disposed as shown in Figure 1 with the belt on the motor pulley. Cover 48 is closed thereby confining the suction air stream to nozzle 11, passage 12, the fan chamber and the filter bag. It will be noted that finger 32 is then located on the forward side of the pulley and out of contact with the belt.

If it is desired to replace the belt or to gain access to it for any reason, it is merely necessary to unlatch catch 24 and remove cover 23 along with the belt disconnect mechanism carried thereon since pin 40 and link 46 remain supported by bracket 42. Replacement of cover 23 is accomplished merely by inserting lugs 23a over the rear nozzle lip and pivoting the rear end of the cover into closed position. The belt disconnect is held against displacement while the cover is off by engagement of keeper 35 in one of the holes 36 in sector 34.

Conversion to off-the-floor operation is accomplished very easily. The operator first lifts converter cover 48 to the position shown in Figure 3. In so doing, rod 49 is pivoted counterclockwise rotating the belt disconnect to lift the belt free of pulley 19. This will best be understood by reference to Figures 1 to 3. As link 46 is moved horizontally forward, sector 34 and pinion 33 are rotated to swing finger 32 and groove 31 about 180° to the position shown in Figure 3 wherein the belt is seen to be supported entirely free of pulley 19. Insertion of converter 55 into casing 53 causes the belt runs to be depressed into notches 57, 57 as catch 59 engages notch 60 to lock the converter in place. In this position, the nozzle is sealed from the rear portion of passage 12 by the firm seating of the bottom and sides of the converter against the belt and the adjacent walls of passage 12. The usual hose and dusting tools may now be attached to the converter for off-the-floor cleaning, the air flow being confined to the hose, converter, rear end of passage 12, the fan and the filter. It is to be observed, as clearly shown in Figure 3, that while the converter is in place, it blocks closing of cover 48 and restoration of driving belt 21 to pulley 19. Thus, cover 48, and the links connecting it to the belt disconnect constitute a simple, yet positive safety inter-lock effectively preventing operation of the invention in an improper sequence.

Reconversion is equally as simple and convenient, it merely being necessary for the operator to withdraw converter 55 and close cover 48. As is self-evident from the foregoing, this operation rotates the parts in the reverse direction to return the belt to the pulley and the parts to the position shown in Figure 1.

It will be readily apparent that the simple structure described above is characterized by ruggedness, positiveness, convenience, high efficiency, ease of operation and marked improvement structurally and functionally over constructions heretofore available.

Obviously, the principles of the invention are obtained in many variations of the structure hereinabove described as illustrative of a working embodiment of the invention and it is to be understood that such variations are comprehended within the scope of this invention.

What I claim is:

1. In combination with a suction cleaner of the type having a suction nozzle extending crosswise of the cleaner body, a motor-driven fan supported rearwardly of said nozzle, an agitator in said nozzle, a belt interconnecting said agitator and motor-driven fan, means forming a suction air passageway and a belt tunnel between said fan and said nozzle, and belt drive disconnecting means permanently carried by said cleaner for discontinuing the operation of said agitator during off-the-floor cleaning; of normally covered port means in the upper portion of said nozzle communicating with said air passageway intermediate said agitator and said fan, and a converter device separable from said cleaner but insertable through said port means when uncovered to convert said cleaner to use for off-the-floor cleaning, said converter being cooperable with said disconnected belt and said

air passageway means to seal said nozzle from said fan when said converter is seated in said port means.

2. The combination recited in claim 1 characterized in that said converter is formed to engage said belt against a portion of said air passageway means to prevent air leakge therearound via said nozzle during off-the-floor cleaning.

3. The combination recited in claim 2 characterized in that said converter is insertable downwardly through said port means onto the runs of the belt to depress the disengaged belt against the bottom of said air passageway means, and means for locking said converter in place against said depressed belt.

4. In combination with a suction cleaner of the type having a suction nozzle extending crosswise of the cleaner body, a motor-driven fan supported rearwardly of said nozzle, an agitator in said nozzle, a belt interconnecting said agitator and motor-driven fan, means forming a suction air passageway and a belt tunnel between said fan and said nozzle, and belt drive disconnecting means for discontinuing the operation of said agitator during off-the-floor cleaning; of normally covered converter port means in the top wall of said nozzle in communication with said air passageway means at a point intermediate the ends of said belt when disconnected, and a converter tool normally separated from said cleaner but insertable through said port means to convert said cleaner to off-the-floor operation, said converter, when inserted, cooperating with said air passageway and said belt to seal said nozzle effectively from said fan whereby the suction air stream is constrained to flow through said converter to said fan.

5. The combination defined in claim 4 characterized by the provision of means associated with said belt drive disconnecting means and operable to prevent restoration of said belt drive while said converter device is in place on said cleaner.

6. The combination with a suction cleaner of the type having a suction nozzle extending crosswise thereof, a vertical axis motor-fan unit mounted rearwardly thereof, means providing an air passage and a belt tunnel between said fan and said nozzle, an agitator in said nozzle, a belt in said passage interconnecting said agitator and said unit; of means located on said nozzle operable to receive a converter device to convert said cleaner to off-the-floor operation, means for disconnecting said belt for off-the-floor cleaning, manual means for operating said belt disconnect independently of said converter, said manual means being fixed to said cleaner and said belt disconnecting means being readily detachable from said cleaner and from said manual means as a unitary assembly to facilitate inspection and servicing of said cleaner.

7. The combination defined in claim 6 characterized in that said belt disconnecting means includes a cover plate for the driven end of said belt.

8. The combination defined in claim 7 characterized in that said cover plate forms substantially a major bottom portion of said air passage whereby removal of said cover exposes the full length of said belt for servicing and replacement.

9. In a suction cleaner, a cleaner body, a nozzle at the forward end of said body, a suction creating fan, a suction air passageway between said fan and nozzle, a motor for driving said fan, an agitator in said nozzle, a relatively flexible belt in said air passageway between said motor and agitator to operate the latter, a port in said body above said nozzle and connected to said air passageway for receiving a converter element to convert the cleaner for off-the-floor cleaning, a cover movable for closing and opening said port, belt shifting means connected to said cover and actuated upon movement of said cover to its open position to remove said belt from said motor to render said agitator inoperative in said nozzle, a converter element insertable through said opened port and engageable with said belt to depress the latter against a wall of said air passageway and cut off communication between said nozzle and fan.

10. In a suction cleaner, a cleaner body, a nozzle at the forward end of said body, a suction creating fan, a suction air passageway between said fan and nozzle, a motor for driving said fan, an agitator movably mounted in said nozzle, a belt in said suction air passageway between said motor and agitator to operate the latter, a port in said body above said nozzle and connected to said suction air passageway for receiving a converter element to convert the cleaner for off-the-floor cleaning, a cover for said port and movably mounted on said body, belt shifting means connected to said cover and movable into engagement with said belt to remove the latter from said motor to render said agitator non-movable upon movement of said cover to open position with respect to said port, and a converter element insertable through said opened port into said suction air passageway and having means to receive said belt to cut off communication between said nozzle and fan.

11. A converter element for a suction cleaner of the type having a nozzle, an agitator in the nozzle, a suction creating fan, a motor for driving the fan, an air passageway between the fan and nozzle, a port in the air passageway for receiving the converter element, a resilient belt in the air passageway connecting the motor and agitator, recess means in the air passageway to receive the belt therein when the belt is displaced from its normal position by the converter element, said converter element comprising a conduit having an opening for connection with said fan when the converter element is inserted through said port into said air passageway, and means on said conduit for receiving the belt to displace the latter into said recess means to enclose said belt when said converter element is in position in said air passageway.

12. A floor type vacuum cleaner comprising an electric motor having a vertical shaft, a fan chamber arranged below said motor and having a fan connected to said saft to be driven thereby, said fan chamber being provided with an air inlet on the under side thereof, a nozzle having a downwardly presented mouth, and an agitator operatively associated therewith, a communication forming an air passageway between said nozzle and said fan inlet for inducing a flow of air into said nozzle during operation of said fan, said shaft extending through said fan inlet into said communication, a belt arranged in driving relationship with said shaft and agitator for actuating the latter during operation of said fan and extending through said communication, belt shifting means operable to engage with the belt adjacent said shaft for lifting the belt out of driving relationship therewith and upon a subsequent operation to release said belt so as to re-engage the latter with said shaft, said communication being provided

with an upwardly facing normally closed converter port which is arranged between said shaft and agitator, a detachable converter coupling comprising a hollow air conducting member adapted to be inserted through said port, when open, and to be seated in said passageway, said member being shaped to fit said passageway and to cooperate with the walls thereof to prevent the flow of air from said nozzle to said fan inlet, said coupling having provisions for accommodating said belt, a cover for closing said port, and a positive connection between said cover and belt shifting means for operating the latter by movement of said cover which opens and closes said port.

13. A floor type vacuum cleaner comprising an electric motor having a vertical shaft, a fan chamber arranged below said motor and having a fan connected to said shaft to be driven thereby, said fan chamber being provided with an air inlet on the under side thereof, a nozzle having a downwardly presented mouth, and an agitator operatively associated therewith, a communication forming an air passageway between said nozzle and said fan inlet for inducing a flow of air into said nozzle during operation of said fan, said shaft extending through said fan inlet into said communication, a belt arranged in driving relationship with said shaft and agitator for actuating the latter during operation of said fan and extending through said communication, belt shifting means operable to engage with the belt adjacent said shaft for lifting the belt out of driving relationship therewith, and upon a subsequent operation to release said belt so as to re-engage the latter with said shaft, manually operable means positively connected with said belt shifting means for operating the same, said communication being provided with an upwardly facing normally closed converter port which is arranged between said shaft and agitator, a detachable converter coupling comprising a hollow air conducting member adapted to be inserted through said port, when open, and to be seated in said passageway, said member being shaped to fit said passageway and to cooperate with the walls thereof to prevent the flow of air from said nozzle to said fan inlet, said coupling having provisions for accommodating said belt, said means for operating said belt shifting means being constructed and arranged to be positioned, when said belt shifting means is positioned so that said belt is arranged in driving relationship with said shaft, to form a barrier for said converter port to prevent at such time the insertion of said air conducting member in said port.

14. The combination with a suction cleaner having a suction nozzle, a motor-fan unit supported rearwardly of said nozzle, an agitator in said nozzle, a driving belt extending between said motor-fan unit and said agitator for normally driving the latter, means forming a suction air passage and a belt tunnel extending between said nozzle and said unit, said suction air passage including a readily detachable belt access cover member, of a belt drive disconnect comprising a drive disconnect assembly and a manually operable assembly for moving said disconnect between a position in which said belt drive is operable to drive said agitator and a second position in which said drive is inoperable to drive said agitator, one of said assemblies being permanently carried by said cleaner and the other of said assemblies being carried by and being readily removable with said belt access cover.

15. The combination with a suction cleaner having a suction nozzle, a motor-fan unit supported rearwardly thereof, an agitator in said nozzle, a driving belt extending between said motor-fan unit and said agitator to drive the latter during on-the-floor operation of said cleaner, means forming a combined suction air passage and belt tunnel between said nozzle and said motor-fan unit, of a belt drive disconnect for disconnecting said agitator from said motor-fan unit during off-the-floor operation of said cleaner, a normally closed converter port opening into said suction air passage at a point between said agitator and said motor-fan unit, a converter tool insertable through said port and cooperating with the walls of said suction passage and said belt to substantially seal said nozzle from said motor-fan unit, said converter having an outlet opening positioned to one side of said belt whereby the off-the-floor suction air stream flows to said motor-fan unit in a path not traversing said belt and located to one side thereof.

16. The combination with a suction cleaner having a suction nozzle, a motor-fan unit supported rearwardly thereof, an agitator in said nozzle, a driving belt extending between said motor-fan unit and said agitator to drive the latter during on-the-floor operation of said cleaner, means forming a combined suction air passage and belt tunnel between said nozzle and said motor-fan unit, of means mounted on said suction air passage for supporting the motor-fan unit end of said belt in a stationary, non-agitator driving position during off-the-floor operation of said cleaner, a normally closed converter receiving port opening into said suction air passage from the upper side thereof and at a point between said agitator and said motor-fan unit, a hollow converter tool adapted to be inserted through said port and being cooperable with the walls of said passage and the runs of said belt to substantially close off said nozzle from communication with said motor-fan unit during off-the-floor operation of said cleaner, and an outlet for said converter opening into said suction air passage to one side of said belt whereby the off-the-floor suction air stream flows to said motor-fan unit in a path which is unobstructed by said belt.

17. A suction cleaner as defined in claim 16 including manually operable means supported on said cleaner operable to shift said belt out of driving position with respect to said motor-fan unit and onto said belt supporting means wherein said belt is inoperative to drive said agitator, said manually operable means also being operable to return said belt from said belt supporting means back into agitator driving relation with respect to said motor-fan unit.

18. The combination with a suction cleaner having a main body, a suction nozzle at the forward end thereof, a vertical axis motor-fan unit on said body rearward of said nozzle, means forming a combined suction air passage and belt tunnel extending from said nozzle to the fan inlet of said motor-fan unit, a driving belt in said tunnel and extending between a driving pulley on said unit and said agitator to drive the latter during the on-the-floor operation of said cleaner, a normally closed converter receiving passage opening through the top side of said suction air passage forwardly of said motor-fan

unit, said converter passage being inclined downwardly and rearwardly, means on said cleaner adjacent said pulley for supporting said belt in a stationary non-agitator driving position during off-the-floor operation of said cleaner, one run of said belt being positioned close to one wall of said suction passage when the belt is positioned on said belt support, a converter tool adapted to be inserted through said converter passage and cooperable with said suction passage and said belt to close off said nozzle from said fan inlet when in place on said cleaner, and an outlet opening in said converter opening into said suction passage to one side of said belt whereby the off-the-floor suction air stream flows to said fan inlet in a path which is unobstructed by said belt.

19. A suction cleaner as defined in claim 18 in which the path of said converter tool upon insertion traverse at least one run of said belt whereby said run is contacted by the converter and deflected into a position against a wall of said suction air passage as said converter is inserted into said converter receiving passage, and means for locking said converter in place in said last mentioned passage.

20. A floor type vacuum cleaner comprising an electric motor having a vertical shaft, a fan chamber arranged below said motor and having a fan connected to said shaft to be driven thereby, said fan chamber being provided with an air inlet on the under side thereof, a nozzle having a downwardly presented mouth, and an agitator operatively associated therewith, a communication forming an air passageway between said nozzle and said fan inlet for inducing a flow of air into said nozzle during operation of said fan, said shaft extending through said fan inlet into said communication, a belt arranged in driving relationship with said shaft and agitator for actuating the latter during operation of said fan and extending through said communication, belt disconnecting means operable to disconnect said belt from driving relationship with said motor and upon a subsequent operation to re-establish said belt drive to said agitator, said communication being provided with an upperwardly facing, normally closed converter receiving passage which is arranged between said shaft and agitator, a detachable converter coupling comprising a hollow air conducting member adapted to be inserted into said passage, when open, and to be seated in said air passageway, said member being shaped to fit said air passageway and to cooperate with the walls thereof to prevent the flow of air from said nozzle to said fan inlet, said coupling having provisions for accommodating said belt, a converter barrier for said converter receiving passage normally positioned to prevent insertion of said converter coupling, and a positive connection between said barrier and belt disconnecting means for operating the latter to disconnect said belt by movement of said barrier to a position in which said barrier does not interfere with the insertion of said converter coupling into said converter receiving passage.

21. A floor type vacuum cleaner as defined in claim 20 characterized in that the presence of said converter coupling in said converter receiving passage blocks the return of said barrier to the normal position thereof barring insertion of said coupling and thereby prevents re-establishing said agitator drive so long as said cleaner is converted to off-the-floor cleaning operation.

22. A floor type vacuum cleaner comprising an electric motor having a vertical shaft, a fan chamber arranged below said motor and having a fan connected to said shaft to be driven thereby, said fan chamber being provided with an air inlet on the under side thereof, a nozzle having a downwardly presented mouth, and an agitator operatively associated therewith, a communication forming an air passageway between said nozzle and said fan inlet for inducing a flow of air into said nozzle during operation of said fan, said shaft extending through said fan inlet into said communication, a belt arranged in driving relationship with said shaft and agitator for actuating the latter during operation of said fan and extending through said communication, belt shifting means operable to engage with the belt adjacent said shaft for lifting the belt out of driving relationship therewith, and upon a subsequent operation to release said belt so as to re-engage the latter with said shaft, manually operable means positively connected with said belt shifting means for operating the same, said communication being provided with an upwardly facing normally closed converter port which is arranged between said shaft and agitator, a detachable converter coupling comprising a hollow air conducting member adapted to be inserted through said port, when open, and to be seated in said passageway, said member being shaped to fit said passageway and to cooperate with the walls thereof to prevent the flow of air from said nozzle to said fan inlet, said coupling having provisions for accommodating said belt, said means for operating said belt shifting means being constructed and arranged to form a barrier against the insertion of said converter coupling when said belt is in driving relationship with said shaft, said barrier normally extending into the path of said converter coupling and being blocked from returning thereto by said coupling when said coupling is in place in said port whereby said belt drive to said agitator cannot be re-established so long as said cleaner is converted to off-the-floor operation.

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