

April 10, 1956

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2,740,982

SUCTION CLEANER WITH AGITATOR DISCONNECT

Filed Jan. 17, 1951

3 Sheets-Sheet 1

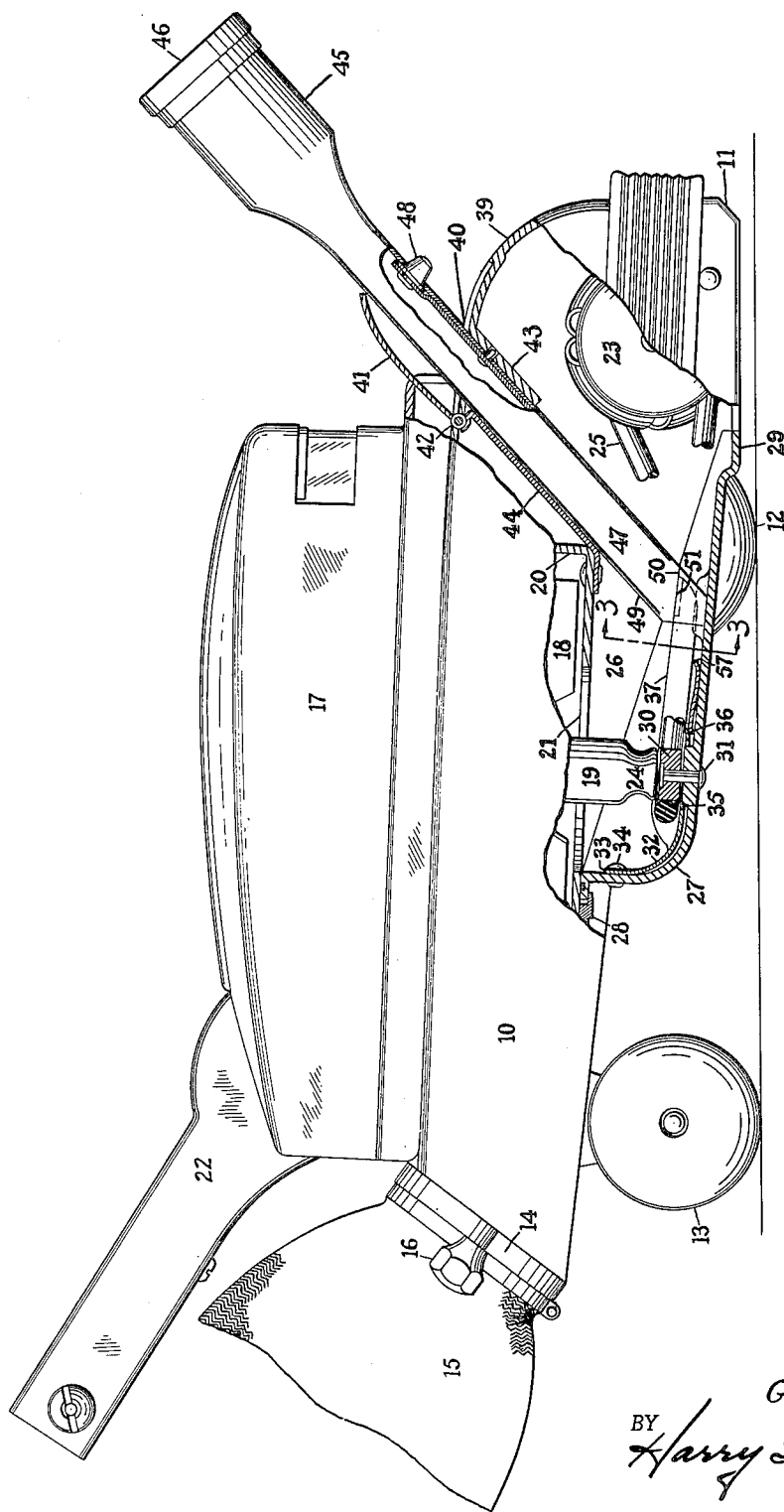


Fig. 1

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3 Sheets-Sheet 2

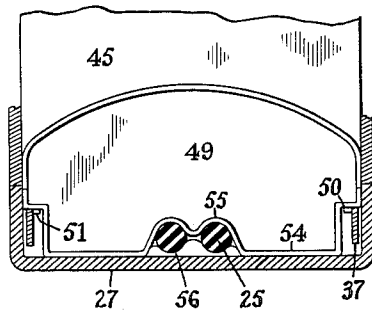
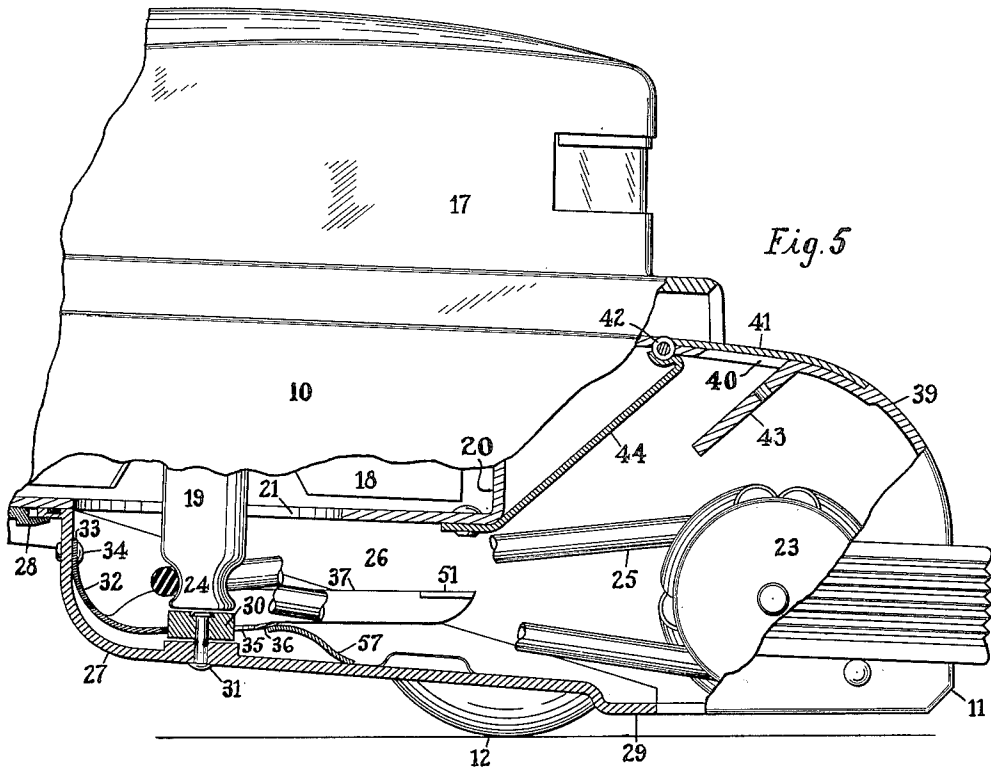


Fig. 3

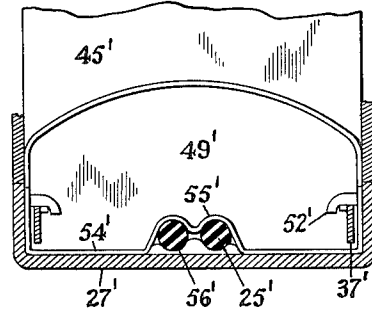


Fig. 4

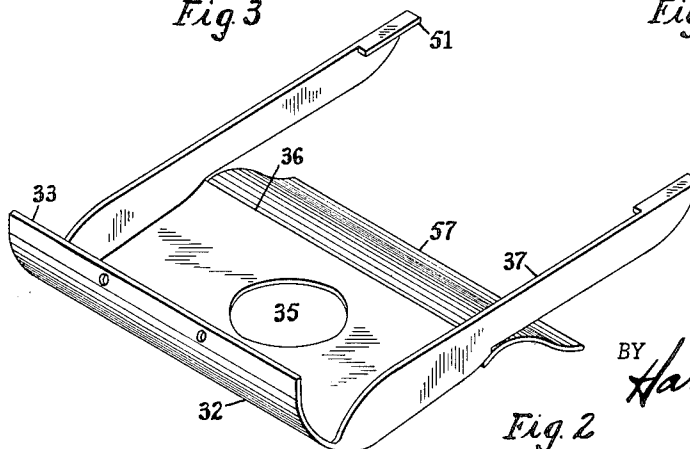


Fig. 2

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3 Sheets-Sheet 3

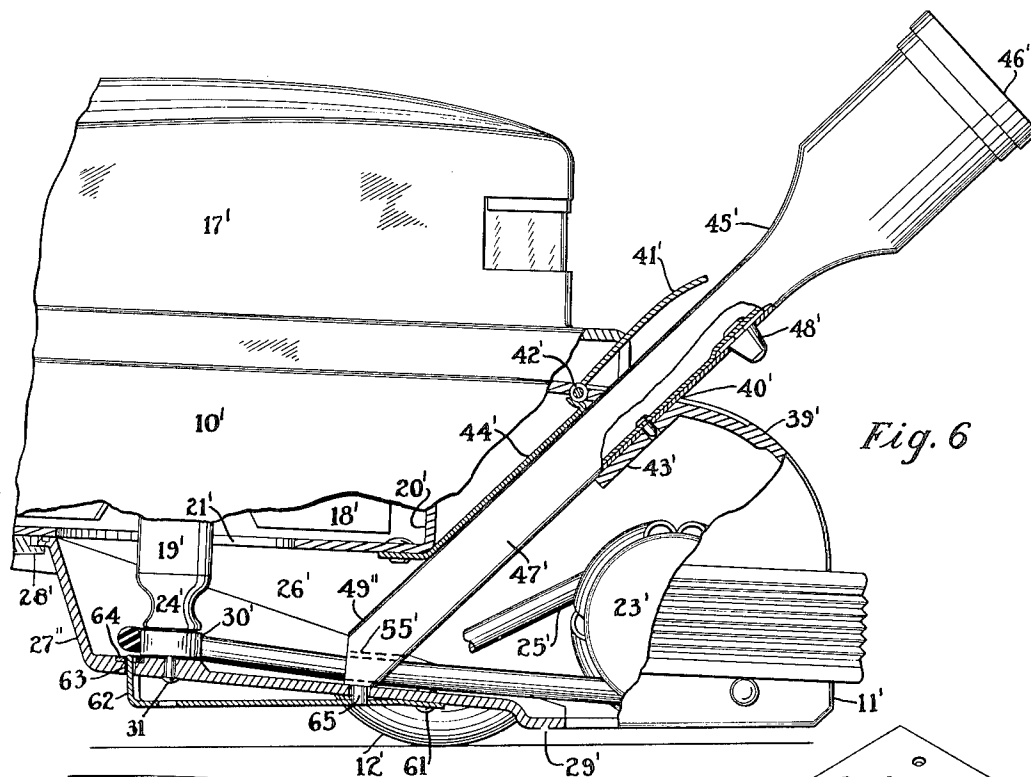


Fig. 6

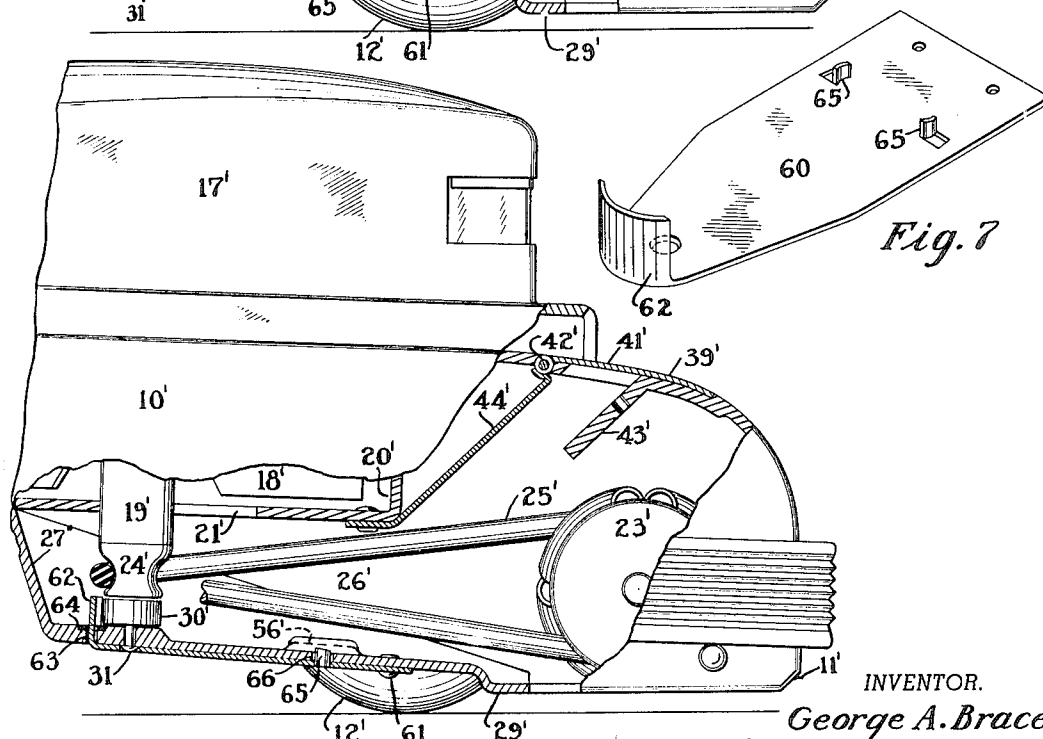


Fig. 7

Fig. 8

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2,740,982

## SUCTION CLEANER WITH AGITATOR DISCONNECT

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Application January 17, 1951, Serial No. 206,428

16 Claims. (Cl. 15—332)

This invention relates to suction cleaners and more particularly to new and improved means for converting the same for off-the-floor cleaning operation.

More specifically, the invention provides an unusually simple and highly efficient means by which the agitator drive is automatically disconnected and re-established as an incident of coupling and uncoupling the converter tool. Various constructions have been proposed heretofore having the same or a closely related objective. However, all have been complex and costly in the extreme and most require special operations performed in sequence by the user. In contrast, the present invention is exceedingly simple structurally and functionally and only the single step of coupling or uncoupling of the converter is involved. Moreover, the cost of incorporating the invention in a suction cleaner is negligible.

In essence, the invention contemplates employing the coupling movement of the converter to the cleaner to shift the agitator belt onto an idler or other non-driven support in combination with a simple spring for returning the belt to the pulley automatically as the converter tool is uncoupled from the cleaner. As will be apparent below, it is not necessary that the converter actually remove the belt from the pulley during the coupling operation but only that the coupling of the converter condition the belt so that it is automatically disconnected when the cleaner motor is started.

It is therefore a primary object of the invention to provide a suction cleaner having a new and improved means for deactivating the agitator as an incident of converting the same for off-the-floor operation.

Another object is the provision of an agitator drive disconnect in which coupling of the converter to the cleaner conditions the driving belt for removal from driving relation to a pulley therefor when the driving motor is started.

A still further object is the provision of improved means for automatically restoring the agitator drive as an incident to the removal of the converter tool from the cleaner.

A further object is the provision of means for converting a suction cleaner to off-the-floor operation which utilizes the coupling operation of the converter tool to disconnect the agitator drive and remove the belt to one side of the suction air stream so that it does not interfere with the flow thereof.

Yet another object is the provision of a converter actuated agitator disconnect which is entirely supported upon a removable cover plate for the suction air passage.

A more specific object is the provision of a disconnect which is located exteriorly of the cover plate so that it cannot become fouled by dirt or grit and which is self-purging with respect to any foreign matter accidentally lodging therein.

Various other objects and advantages of the invention will become apparent from the following detailed specification taken in connection with the accompanying drawings, wherein:

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Figure 1 is a side view of a suction cleaner incorporating the invention with parts thereof broken away to show the position of certain components when the converter tool is in place;

5 Figure 2 is an isometric view of the agitator drive restoring actuator;

Figure 3 is a sectional view along line 3—3 on Figure 1;

10 Figure 4 is a sectional view similar to Figure 3 but showing an alternate arrangement of the operating connection between the restoring actuator and the converter tool;

Figure 5 is a view similar to Figure 1 and showing the position of certain parts when the converter tool is removed.

15 Figure 6 is a side view of a cleaner including another embodiment of the invention and showing the position of the parts when the converter is connected to the cleaner;

20 Figure 7 is an isometric view of the agitator drive restoring actuator thereof; and

Figure 8 is a view showing the position of parts after the converter tool has been removed.

The first embodiment illustrated in Figures 1 to 5 comprises a suction cleaner of the floor type having a main body casting 10 provided with a downwardly opening suction nozzle 11 extending crosswise of its front end. The body is supported by a pair of carrier wheels 12 located immediately rearward of the suction nozzle and a pair of rear wheels 13 underlying the exhaust air outlet 14 for the fan chamber. The usual dirt filtering bag 15 is detachably secured to the exhaust outlet as by thumb-screws 16.

Underlying the removable motor hood 17 is a suction unit comprising an electric driving motor and a suction fan. Suction fan 18 is mounted directly upon the downwardly projecting motor shaft 19 and is enclosed by fan chamber 20. This chamber is provided with an air inlet or fan eye 21 surrounding shaft 19. The propelling handle not shown, has its lower end detachably connected to handle socket 22 which is pivotally connected to the cleaner body at a point enclosed by the rear of motor hood 17.

A cylindrical agitator 23 of conventional construction is rotatably mounted within the suction nozzle 11 and has a driving connection with pulley 24 provided by an endless rubber belt 25. This belt extends through a suction air passage 26 formed on the under side of the cleaner body and extending between the suction nozzle and fan inlet 21. This passage is formed in part by wall members cast integral with the cleaner body and in part by a removable cover plate 27. The forward end of this cover is formed to interlock with notches in the main casting and its lower side 29 serves as the rear nozzle lip of suction nozzle 11. The rear end of the cover plate is removably locked to the under side of the fan chamber by a latch 28.

An idler pulley 30 is secured to the bottom of the cover plate by pin 31 at a point closely spaced from and in alignment with the end of pulley 24. However, it is not necessary that pulley 30 be rotatably supported, since it has been found that a similar shaped boss integral with the bottom of the cover plate functions quite as well and provides a more economical construction. This pulley or boss serves to support the belt when it is shifted therefrom driving pulley 24 in a manner which will be described presently.

The device for restoring the belt to driving position on pulley 24 will be best understood by reference to Figure 2. This device comprises a plate-like actuator member 32 of spring steel or the like. This member is shaped as shown so as to closely fit within and between the walls of the heel portion of cover plate 27. Its upper end

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33 is firmly secured to the cover by rivets 34. A slightly elongated opening 35 in its forward central portion surrounds idler 30 and permits the spring to move up and down without engaging the idler. The forward end of actuator 32 is preferably provided with upwardly curved lip 36 extending crosswise of passage 26. When actuator 32 is in its normal, unstressed condition illustrated in Figure 5, lip 36 is closely spaced below the lower run of belt 25. However, when the spring is depressed downwardly by means which will be described presently, lip 36 lies close to the bottom wall of the cover plate, as appears in Figure 1, and permits the belt to occupy a stationary position on idler 30 without interference from the actuator.

The means for depressing actuator spring 32 comprises at least one and preferably two arms 37, 37 bent upwardly from the opposite sides of the actuator and extending forwardly against the opposite side walls of suction air passage 26. The forward end of arms 37 lie in the path of the converter tool so that as the end of this tool is moved downwardly, it depresses the arms and spring 32. It will be readily apparent that the forces transmitted by arms 37 act in plane of these arms. Consequently, these arms do not bend, but serve merely to depress actuator 32.

The top forward wall 39 of the suction nozzle is provided with a converter port 40 which is normally closed by cover plate 41 having a hinge connection 42 to the main body. Members 43 and 44 extend downwardly from port 40 and provide an inclined converter guide passage for conveyor tool 45. This tool has a circular outer end 46 to which the usual suction hose can be connected in the customary manner. The lower end 47 of the converter is of rectangular shape designed to be closely spaced from the side walls of suction passage 26 so as to seal the suction nozzle from the eye of the fan when the converter is in place. A locking detent 48 on the converter engages with the cleaner body to lock the converter in place. The rear wall of the converter is provided with a large opening 49 which provides the communication means between the converter tool and the rear end of the suction air passage.

Referring to Figure 3, it will be seen that the opposite lower side walls 50 of the converter are pressed inwardly to provide shoulders 50, 50 which engage the upper forward edges 51 of arms 37. Accordingly, it will be obvious that, as the converter is inserted downwardly through the guide passage, shoulders 50 engage the ends of arms 37 and pivot them downwardly thereby depressing the forward end of spring actuator 32.

An alternate arrangement of the inter-engaging parts of the converter and arms 37 is illustrated in Figure 4. According to this construction, the forward ends of arms 37' are bent outwardly away from the side wall of the suction air passageway sufficiently to freely receive the side wall of the converter tool. A pair of pins 52' are rigidly secured to the interior of the converter side walls and engage the upper edges of the arms to depress them as the converter is inserted. This arrangement has the advantage of providing a better air seal between the converter and the walls of the suction passage.

The bottom end wall 54 of the converter is provided with a pair of grooves 55 which cooperate with a similar pair of grooves 56 in the bottom wall of cover 27 to receive the runs of the agitator belt and to provide an air seal around the belt while the converter is in place.

In order to prevent dirt and foreign matter from collecting below the actuator spring 32, a very light Phosphor bronze plate 57 is secured to the under side of the forward edge of spring 32 and its forward end rides along the bottom of the cover plate at all times. Thus, this light spring 57 provides an effective seal against the entry of dirt beneath the spring. The remaining edges of actuator 32 are so closely spaced from the side walls of the cover that little or no dirt can enter at this point. To

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further safeguard against the entry of dirt, the under, peripheral edges of plate 32 and of opening 35 may be provided with a gasket of sponge rubber or the like.

#### Operation

When the cleaner is being used for on-the-floor operation, the parts are in the position shown in Figure 5. Thus, converter cover 41 is closed and the suction air flow passes upwardly into nozzle 11, through passageway 26 and into the fan eye. The agitator driving belt 25 is in driving position on pulley 24, and spring 32 together with sealing plate 57 is in the position shown with lip 36 of the spring spaced slightly below the lower run of belt 25.

If the user desires to convert the cleaner to off-the-floor operation, she merely opens the converter port and inserts converter tool 45 downwardly therethrough. As she does so, the lower end of the converter first strikes the upper run of the belt and depresses it. Further downward movement of the converter brings shoulders 50, 50 into engagement with the upper forward edges 51 of arms 37. As the converter is pressed to its seat, both runs of the belt are depressed into grooves 56 on the bottom of suction passage 26. The forward lip 36 of the actuator spring is also depressed to the position shown in Figure 1. If the motor is operating during the insertion of the converter, depression of the upper run of the belt will cause it to run off pulley 24 onto idler 30. If the motor is not operating, it is likely that the belt will remain on the pulley. However, immediately upon starting the motor, the belt will run off onto the idler. As is clearly evident from Figure 1, both runs of the belt, rearwardly of the end of the converter, lie closely parallel to the bottom of cover 27 completely removed from the path of the air flowing down the converter and upwardly through fan eye 21. Consequently, the air stream does not pass through the runs of the belt and the belt neither interferes with the air flow, now does it tend to become fouled with ravellings or other objects carried in the air stream.

To reconvert the cleaner for on-the-floor operation, the operator merely depresses locking detent 48 on the under side of the converter and withdraws it from the converter port. As arms 37 are released, actuator spring 32 moves lip 36 upwardly against the under side of the belt runs and shifts the belt back onto driving pulley 24. The operator then closes converter cover 41 and the cleaner is ready to clean carpets.

#### Second embodiment

The second embodiment illustrated in Figures 6 to 8 is very similar to the first described embodiment and differs primarily in the use of a different arrangement of the spring actuator for restoring the agitator drive. Accordingly, the same reference characters distinguished by a prime or a double prime have been employed to designate the same or similar parts. The modified actuator comprises a stiff strip spring 60 having its forward end rigidly secured to the under forward side of pulley cover plate 27'', as by rivets 61. Its rear end 62 is bent upwardly at right angles and extends through an opening 63 in the cover plate immediately rearward of idler 30'. A resilient pad 64 may be secured about end 62 to provide a better air seal. A tab 65 is struck upwardly from the spring and projects through a second opening 66 in the bottom of the cover plate at a point underlying the lower end of converter 49'' when it is in place in the cleaner.

#### Operation

When the cleaner is conditioned for on-the-floor cleaning, the position of the parts is as illustrated in Figure 8. Note that actuator spring 60 then lies flush with the bottom wall of cover 27'' and that end 62 and tab 65 extend above the interior wall of the cover. As the converter is inserted, it engages the upper sides of the

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belt runs and depresses them into grooves 56' in the bottom of the cover. It also abuts the top of the tab 65 and depresses spring 60 to the position shown in Figure 6 wherein the upper end of tab 62 is substantially flush with the bottom wall of the cover. Rotation of pulley 24' then shifts the belt onto idler 30' where it remains so long as the converter is coupled to the cleaner. It is thus evident that the agitator is de-activated with the result that it can cause no injury to the carpet during off-the-floor cleaning operation.

To reconvert the cleaner to on-the-floor operation, the operator depresses latch 48' on the converter tool and uncouples it from the cleaner. As she does so, spring 60 moves upwardly and end 62 shifts the belt off idler 30' and back onto driving pulley 24' thereby restoring the agitator drive.

The second embodiment has the distinct advantage of having the belt restoring spring located exteriorly of the suction passageway where it is impossible for it to become fouled with grit and foreign material. If any dirt does collect between the actuator and the cover plate, it is released as soon as the converter is inserted and the spring is pressed away from the cover. Any dirt collecting between end tab 62 and the idler is self-purging in the same manner.

From the foregoing discussion of two illustrative embodiments of the invention, it will be obvious that an agitator disconnect has been provided which is characterized by unusual simplicity, ruggedness, low cost and, in particular, one which is fool proof in operation. No skill or special operation is required on the part of the operator. In particular, there are no steps which must be carried out in sequence, since there is but the single step of inserting the converter and withdrawing it. Upon insertion of the converter, energy is automatically stored in the spring which, upon withdrawal of the converter, is utilized to restore the driving connections between the motor and the agitator.

While I have shown but two embodiments of my invention it is to be understood that these 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 having a suction nozzle provided with a rotary agitator, a motor-fan unit on said cleaner having a belt pulley, a belt extending between said agitator and said pulley, means forming a suction air passage surrounding said belt and extending between said nozzle and said motor-fan unit, said passage having a removable cover plate opposite the end of said pulley, belt supporting means carried by said plate closely adjacent the end of said pulley for supporting said belt out of driving relation to said pulley during off-the-floor operation of said cleaner, means for connecting a converter device to said suction air passage, means energized solely by a spring for shifting said belt from said supporting means back onto said pulley to restore said agitator drive, and means associated with said spring and extending into the path of said converter device operable to restrain said spring while said device is connected to said cleaner and to release said spring from restraint when said converter device is disconnected from said cleaner whereby said spring restores said belt to said pulley.

2. The combination defined in claim 1 wherein said spring actuated belt shifting means is carried by said cover plate and is readily removable along therewith.

3. The combination defined in claim 2 wherein said belt shifting means comprises a spring plate having one end rigidly secured to said cover plate and a free end normally positioned beside said belt when the same is located on said pulley and movable when stressed to a position permitting said belt to rest on said belt supporting means whereby when said spring is released by said con-

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verter device the free end of said spring engages the side of said belt and shifts the belt back onto said pulley.

4. The combination defined in claim 1 wherein said spring actuated belt shifting means is carried on the inner side of said cover plate and is housed within said suction air passage when in place on said cleaner.

5. The combination defined in claim 1 wherein said spring actuated belt shifting means is carried on the exterior side of said cover plate and includes means extending through said cover plate for engaging said belt and shifting the same back onto said pulley.

6. In combination with a suction cleaner of the floor type having a wheel supported body provided with a suction nozzle across the forward end thereof, a suction unit on said body having an air inlet and an air discharge passage, means on said body providing a suction air passage extending between said nozzle and said air inlet, a rotary agitator in said suction nozzle, said suction unit having a belt pulley positioned in said passage, a belt extending between said pulley and said agitator for driving the latter, an idler pulley on a wall of said suction passage closely spaced from and in alignment with said belt pulley and onto which said belt can be shifted to de-activate said agitator, means for coupling a converter tool to said suction passage to convert said cleaner for off-the-floor cleaning, means including a spring supported exteriorly of said suction passage operable to shift said belt from said idler pulley to said belt pulley, and means operable by the coupling of a converter to said cleaner for restraining said spring from shifting said belt back to said belt pulley so long as said converter is coupled to said cleaner.

7. The combination defined in claim 6 wherein said converter is formed to engage said belt as the converter is coupled to said cleaner and depress at least one run thereof to shift the belt off said belt pulley onto said idler pulley automatically and as an incident to the coupling of the converter to the cleaner.

8. The combination defined in claim 7 wherein said spring restraining means operates to stress said spring as said converter is coupled to said cleaner whereby, upon uncoupling said converter, the stress stored in said spring is operable to shift said belt back onto said belt pulley to re-activate said agitator drive.

9. An article of manufacture comprising a belt cover plate for the suction passage of a suction cleaner having a heel shaped depression in one end thereof, a belt supporting means formed on the inner wall of said cover, means normally operative to prevent a belt from being shifted onto said supporting means comprising spring means having one end supported by said cover and having its unsupported opposite end positioned closely adjacent the belt supporting area of said supporting means and movable thereacross when said spring is placed under stress, and means for moving said opposite end away from said belt supporting means and stressing said spring strip whereby when said strip is released it returns to the normal unstressed position thereof and is operable to shift a belt off said supporting means.

10. An article of manufacture as defined in claim 9 wherein said spring means is supported on the exterior side of said cover plate and wherein said end adjacent said belt supporting means is formed to extend through an opening in said plate and across and closely adjacent the belt supporting area of said belt supporting means.

11. The combination with a suction cleaner of the type having a wheel supported main body provided with a suction nozzle across its forward end and a horizontally disposed fan chamber centrally of said body, a vertical axis motor supported above said fan chamber having a downwardly projecting shaft carrying a fan and a belt pulley extending downwardly through an eye in said fan chamber, means forming a generally horizontal suction air passage between said fan eye and said suction nozzle, a rotary agitator in said suction nozzle, a flexible belt

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between said pulley and said agitator for driving the latter from said motor, a converter port in the top side of said suction passage forwardly of said motor and overlying the runs of said belt, belt supporting means closely adjacent and in alignment with the end of said belt pulley for supporting said belt when the belt is shifted thereto from said pulley, cantilever spring means having one end rigidly supported and its other end underlying said belt adjacent said belt supporting means, and a converter tool adapted to be inserted downwardly through said port to depress the runs of said belt to shift the same from said pulley onto said belt supporting means and to engage and depress said cantilever spring means so as to permit said belt to remain on said belt supporting means, means for locking said converter in place in said port and in engagement with said belt and with said depressed cantilever spring means whereby when said locking means is released and said converter is removed said cantilever spring means shifts said belt back onto said belt pulley and reestablishes said agitator drive.

12. The combination defined in claim 11 wherein the lower end of said converter and the bottom of said suction air passage are shaped to receive the runs of said belt in an air tight manner when said converter is locked to said cleaner.

13. The combination defined in claim 11 including resilient means interposed between said cantilever spring means and the adjacent walls of said suction air passage for preventing dirt and foreign matter from collecting beneath said spring means and interfering with the operation thereof.

14. The combination defined in claim 11 wherein the major portion of said cantilever spring means is located exteriorly of said suction air passage and is provided with a belt engaging member and a converter engaging member projecting through openings into said passage.

15. The combination with a floor type suction cleaner having a wheel supported body carrying a suction nozzle at the forward end thereof and a suction unit rearwardly of said nozzle, a rotary agitator in said nozzle, an air passage extending between said nozzle and the inlet of said suction unit, a belt drive extending through said passage between said agitator and a driving pulley on said unit, of means for converting said cleaner to off-the-floor operation comprising, a normally closed converter port opening into said air passage, a converter tool insertable through said port into said passage operable to close off air flow from said nozzle to said unit, belt supporting means in said air passage closely adjacent and in axial alignment with said pulley, said converter port being so located with respect to said belt and to said belt supporting means that said converter is operable when inserted therethrough to shift said belt off said pulley and onto said belt supporting means to de-activate said agitator when said cleaner is con-

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verted to off-the-floor operation, means for automatically resoring said belt to said pulley as said converter is withdrawn from said port comprising spring actuated means carried by said cleaner adjacent said belt supporting means operable to shift said belt back to said pulley when not restrained, said belt restoring means having a portion thereof extending into the path of said converter operable upon the insertion of said converter into said air passage to restrain said spring from shifting the belt back onto said pulley from said belt supporting means so long as the converter is connected thereto.

16. The combination with a suction cleaner having a main body, a suction nozzle thereon provided with a rotary agitator, a motor driven suction unit having a belt pulley carried on the outer end of a shaft projecting outwardly from the suction inlet thereof, a resilient belt extending between said pulley and said agitator for driving the latter during on-the-floor cleaning operations, a suction air passageway extending from said suction nozzle to said suction inlet, said passageway having a normally closed port for receiving a converter tool for use during off-the-floor cleaning operations; of means for de-activating said agitator drive when a converter tool is connected to said converter port comprising, means for receiving said belt from said pulley and supporting the same under substantially the same tension as when it is in place on said pulley, means carried by a converter tool insertible into said port for shifting said belt axially off said pulley and onto said belt receiving and supporting means, and means carried by said body including a cantilever spring having a free end positioned to flex toward and away from one side of said pulley in a path traversed by a run of said belt as the same is shifted between said pulley and said belt receiving means and operative, when stressed, to contact a run of said belt and positively shift said belt off said belt receiving means and restore the same to said pulley as soon as the converter tool is uncoupled from said cleaner.

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