

Nov. 4, 1952

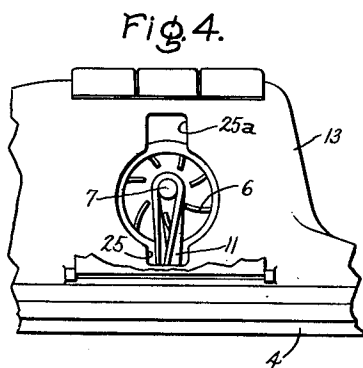
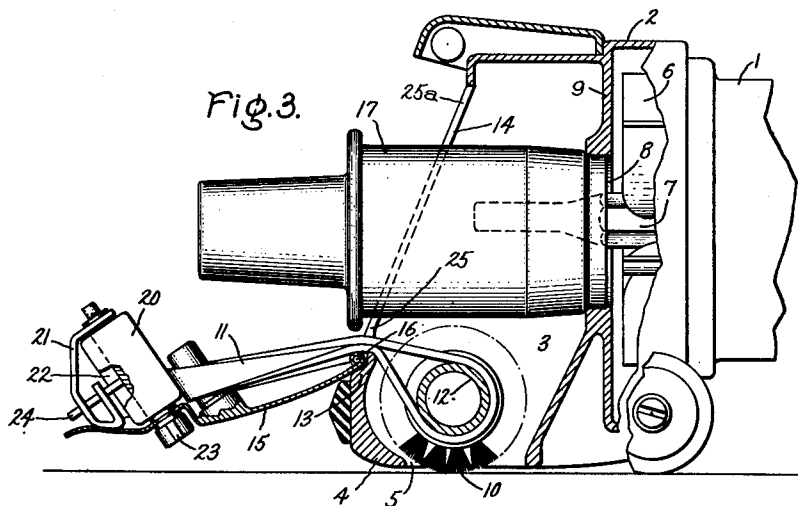
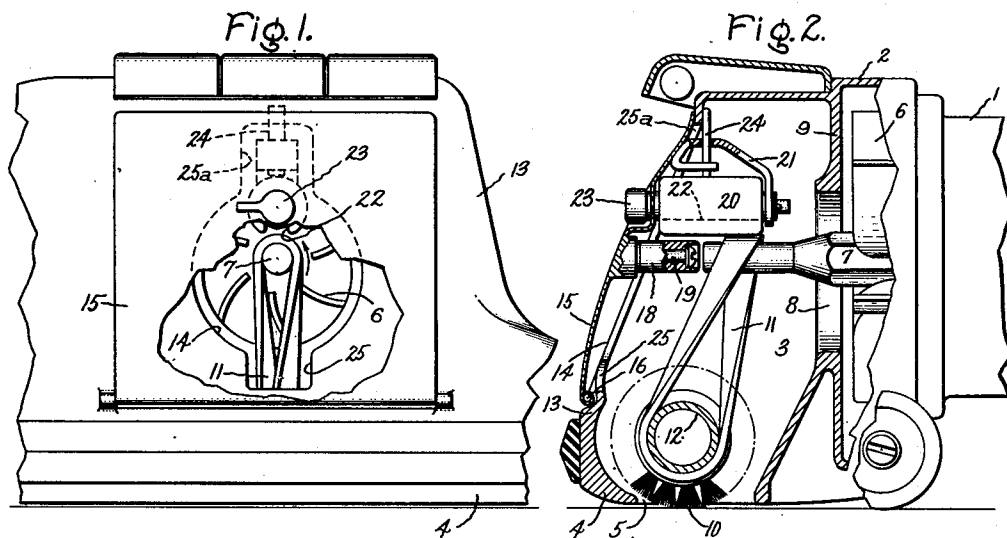
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2,616,115

BRUSH BELT REMOVING MEANS FOR VACUUM CLEANERS

Filed Sept. 3, 1947

2 SHEETS—SHEET 1



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2 SHEETS—SHEET 2

Fig. 5.

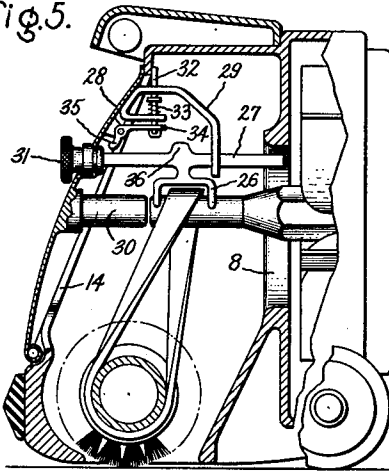


Fig. 6.

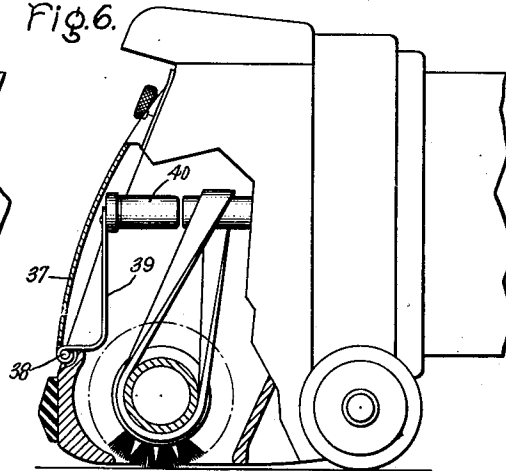


Fig. 7.

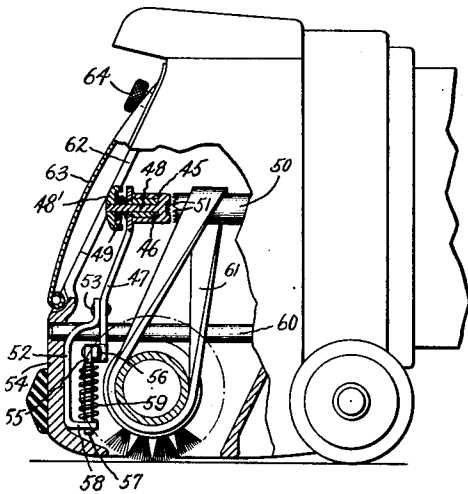


Fig. 8.

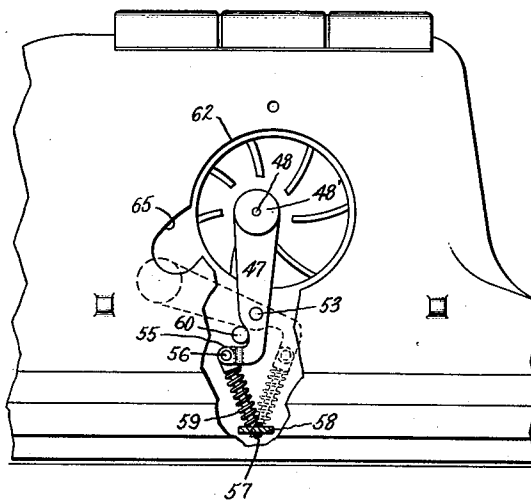
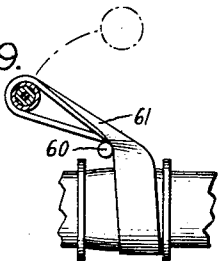


Fig. 9.



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UNITED STATES PATENT OFFICE

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BRUSH BELT REMOVING MEANS FOR
VACUUM CLEANERS

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12 Claims. (Cl. 15—332)

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The present invention relates to vacuum cleaners of the type wherein a rotating cleaning element such as a brush (and hereinafter referred to as a brush) is positioned in the vacuum cleaner floor nozzle and is driven by a belt from the motor which drives the vacuum cleaner fan, and wherein openings are provided in the vacuum cleaner casing to receive what is termed usually a converter tube to enable a suction hose and a cleaning tool attached thereto to be substituted for the cleaner nozzle. Arrangements of this kind are well-known in the vacuum cleaner art.

In vacuum cleaners of this type, it is desirable to remove the belt from the motor shaft when using the suction hose so the brush is not turned and the object of my invention is to provide an improved construction and arrangement for performing this function which is simple in structure and easy and convenient to use.

For a consideration of what I believe to be novel and my invention, attention is directed to the following specification and to the claims appended thereto.

In the drawing, Fig. 1 is a front view, partly broken away, of a portion of a vacuum cleaner; Fig. 2 is a sectional view of the front end of the vacuum cleaner structure shown in Fig. 1; Fig. 3 is a view similar to Fig. 2 showing the parts in a different position; Fig. 4 is a detail front view with the front coverplate broken away; Fig. 5 is a view similar to Fig. 2 of a modification; Fig. 6 is a view similar to Fig. 2 of a further modification; Fig. 7 is a side view, partly broken away, of still another modification; Fig. 8 is a face view of Fig. 7 with the coverplate removed and certain parts of the cleaner structure omitted for purposes of clearness; and Fig. 9 is a detail view of a part of the structure shown in Figs. 7 and 8.

Referring to the drawing, 1 indicates the motor of a vacuum cleaner, 2 the fan housing and 3 the suction inlet chamber having the suction nozzle 4 provided with a transverse suction slot 5. In the fan casing is a fan 6 fixed to motor shaft 7. The motor shaft projects out through an inlet opening 8 in the front wall 9 of the fan chamber (also the rear wall of the suction chamber) into the suction chamber 3. In suction nozzle 4 is a rotating cleaning element 10 here shown as a brush, which at its ends is suitably journaled in the end walls of nozzle 4. The brush is driven from fan motor 1 by a belt 11 which passes over the end of the motor shaft and around a pulley 12 on the brush shaft. In the front wall 13 of the suction chamber is an opening 14 in line with inlet opening 8. Opening 14 is covered normally

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by a coverplate 15, the coverplate in the present instance being shown as pivoted at its lower end on a pivot pin 16.

The structure so far described is a known one and is to be taken as typical of new suitable vacuum cleaner construction. In the drawing only a sufficient portion of the cleaner is shown as is needed to illustrate my invention. In such cleaners when a suction hose and attachments are to be used, the coverplate 15 is removed from in front of opening 14, the belt 11 is removed from the end of the motor shaft and a converter tube as shown at 17 in Fig. 3 is inserted through opening 14 and into opening 8 in the front wall and the fan chamber. The converter tube blocks off communication between suction slot 5 and opening 8. A suction hose for cleaning can be attached to converter tube 17. Afterwards, when use of the suction hose is finished and the converter tube is removed, the belt must be again put back over the end of the motor shaft.

My invention has to do particularly with an improved construction and arrangement for removing the belt from and replacing it on the motor shaft end whereby the operation can be performed easily and quickly by the user.

According to my invention, I provide a pin to which the upper end of the belt may be transferred from the motor shaft end and then it and the belt moved out of alignment with openings 14 and 8, the arrangement being such that the belt can be readily moved back again from the pin to the shaft end.

According to the embodiment of my invention shown in Figs. 1 to 4, coverplate 15 is provided with an axially projecting pin attached to its inner surface which comprises in this form of the invention a sleeve 18 rotatably mounted on a stud 19 which threads into a boss on the coverplate. The pin stands in line with the end of motor shaft 7 but is not in engagement therewith. When the converter tube is to be placed through openings 14 and 8, belt 11 is transferred from the end of motor shaft 7 to sleeve 18 after which the coverplate is swung down to a position as shown in Fig. 3. This moves the belt out of alignment with openings 14 and 8 so that the converter tube can be positioned in the openings.

In the arrangement shown in Figs. 1 to 4, for transferring the belt from the shaft to the pin, I take advantage of the fact that when motor shaft 7 is turned backwards, i. e. in a counterclockwise direction as indicated by the arrow in Fig. 1, the belt is run from the shaft end onto the sleeve. This occurs because the belt has a right-angle

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twist due to shaft 7 being at a right angle to brush 10. Due to the twist in the belt, when the motor shaft operates in its normal forward direction, i. e. clockwise as viewed from the front end, the belt tends to run back on the shaft. But when operated in the other direction the belt tends to run off the shaft. For turning shaft 7 to run the belt from the shaft onto sleeve 18 (and vice versa) I provide a cylinder 20 journaled at one end in coverplate 15 and at the other end in a bracket 21 carried by the coverplate. The cylinder has a longitudinally extending notch 22 which normally stands in line with the top of the belt so that the cylinder is not in engagement with the belt. On the front of the cylinder is a knob or handle 23 by means of which it may be turned. When it is desired to transfer the belt from the motor shaft to sleeve 18, knob 23 is turned in a clockwise direction as viewed in Fig. 1 to bring cylinder 20 into engagement with the top surface of belt 11 and through it turn shaft 7 backwards, the friction between the cylinder and the surface of the belt being sufficient to effect the turning of the motor shaft. This causes the belt to travel from the shaft end onto sleeve 18. Cylinder 20 is of a diameter with respect to the diameter of shaft 7 that a half turn of the cylinder turns shaft 7 an amount sufficient to effect movement of the belt from the shaft end to the sleeve.

Preferably the cover 15 is locked closed normally by a vertically sliding latch or bar 24. The lower end of the bar rests on the surface of cylinder 20. It slides in openings in bracket 21. When in locking position its upper end is positioned behind the front wall 13 at the top of opening 14. When cylinder 20 is turned a half turn notch 22 is brought into line with bar 24 whereupon the bar drops down into the notch as shown in Fig. 3 so that it is moved from locking position. Cover 15 may be now swung on its pivot 16 from the position shown in Fig. 2 down to the position shown in Fig. 3. As shown in Fig. 1 a notch 25 is provided at the lower end of opening 14 through which the belt extends when moved from the Fig. 2 position to the Fig. 3 position. At the upper end of opening 14 is a notch 25a through which bracket 21 and bar 24 pass. With the parts in the position shown in Fig. 3 a converter tube can be inserted through opening 14 into opening 8 as shown in Fig. 3. The converter tube may be held in the openings by a catch (not shown) or other suitable means.

To return the belt to its normal position coverplate 15 is closed i. e. moved back to its Fig. 2 position, after which knob 23 is utilized to turn sleeve 18 through friction contact with the top surface of the belt to roll the belt back onto shaft 7. This requires a half turn of cylinder 20 in a direction opposite to that required for removing the belt from the shaft end to the sleeve. When cylinder 20 is turned, bar 24 is lifted out of notch 22 to its Fig. 2 position to again lock the cover in closed position.

By my invention, it will be seen that the belt can be quickly and easily removed from the shaft end when hose attachments are to be used and later quickly and easily replaced on the shaft end; and that in replacing the belt it will be replaced with the quarter twist in the correct direction for keeping the belt on the motor shaft when the motor is running.

In Fig. 5 is shown a modification wherein the belt is transferred from the shaft end to the pin by means of a spider 26 carried by a rod 27 which

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slides in openings in cover 28 and a bracket 29 carried by the cover. The pin, indicated at 30, is a solid pin carried by cover 28. With this arrangement the belt may be transferred from the shaft end to pin 30 by pulling outward on a knob 31 on the end of rod 27, the upper end of the belt being moved by the spider in an obvious manner. The belt may be moved from the pin back onto the shaft end by pushing knob 31 inward. For locking cover 28 closed, I provide a latch 32 normally held upward in locking position as shown in Fig. 5 by a spring 33. Engaging a head on the lower end of latch 32 is one end of a pivot lever 34, the other end of which is provided with an ear 35 adapted to be engaged by a projection 36 on rod 27. Projection 36 is so positioned with respect to ear 35 that when rod 27 reaches its outermost position i. e. the position in which the belt has been transferred from the motor shaft end to pin 30, the projection engages ear 35 to move latch 32 downward out of locking position. The cover 28 can then be swung down on its hinge after the manner shown in Fig. 3 to move the belt out of alignment with openings 14 and 8.

In Fig. 6 is shown a further modification of my invention wherein the cylinder 20 of Figs. 1 to 4 is omitted, the motor shaft being turned manually to transfer the belt from the shaft end to the pin. In this construction, the coverplate 37 is pivoted on the front of the vacuum cleaner nozzle as shown at 38 and separately mounted on the same pivot is a bracket 39 which carries the pin 40 which in this case is similar to the pin of Figs. 1 to 4. With this modification coverplate 37 is first swung down on its pivot after which the belt is turned manually in the proper direction either by grasping and turning the belt itself or by turning the brush to transfer the belt from the motor shaft end to the pin after the manner already described in connection with Figs. 1 to 4. After the belt has been transferred to pin 40, bracket 39 is turned outwardly on its pivot to move the belt down to a position corresponding to that shown in Fig. 3. The parts are restored to their normal positions by first turning bracket 39 back to the Fig. 6 position, then transferring the belt from the pin back to the motor shaft end by turning the belt manually in the proper direction, and then closing cover 37.

In Figs. 7, 8, and 9 is shown a form of the invention wherein the pin to which the belt end is transferred, instead of being swung outwardly through the opening in the front wall of the suction chamber in the plane of the axis of the motor shaft, is swung sidewise in a plane at right angles to the axis of the motor shaft. In this construction, the pin to which the belt end is transferred comprises a sleeve 45 mounted on a tubular stud 46 fixed to the upper end of a lever arm 47. Sleeve 45 has an axially extending center post 48 which projects through stud 46 to the front side of lever arm 47 and on its end it is provided with a knob 48'. Between knob 48' and the adjacent surface of the lever arm 47 is a compression spring 49 which biases sleeve 45 outwardly to the position shown in Fig. 7 wherein its inner end engages the surface of lever arm 47 and its outer end is out of engagement with the motor shaft end 50. By means of knob 48', sleeve 45 can be moved axially on stud 46 to bring its end into engagement with the motor shaft end and it can be turned on the stud. The facing ends of sleeve 45 and motor shaft end 50 are provided with suitable clutch means, such as the engaging teeth 51

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indicated in Fig. 7, whereby when the sleeve is pushed inwardly into engagement with the shaft end, the motor shaft may be rotated by turning button 48'.

Lever arm 47 is pivotally mounted between its ends on the upper end of a bracket 52, as is indicated at 53. Bracket 52 is fixed to the front nozzle wall 54. The lower end of lever arm 47 has an angular end 55 pivotally connected at 56 to the upper end of a rod 57 which forms a part of an over center spring toggle. The lower end of rod 57 projects through an opening in an intumed ear 58 which forms a part of bracket 52. Between ear 58 and a shoulder on rod 57 is a compression spring 59. At 60 is a stationary shaft or bar which projects across the vacuum cleaner nozzle at one side of the vacuum cleaner belt 61, it being fixed at its ends in the front and rear nozzle walls. It forms a stop for lever arm 47 and also a guide over which the belt is bent. The opening in the front wall of the suction chamber is indicated at 62 and the pivoted cover for such opening is indicated at 63, the latter being normally held closed by a suitable catch (not shown) which may be actuated by a knob 64. At the side of opening 62 is a recess 65.

Normally, the parts stand in the positions shown in Fig. 7 and in full lines in Fig. 8 wherein toggle spring 59 holds the lever arm 47 against shaft 59 with sleeve 45 in axial alignment with shaft end 50, shaft 60 forming a stop for the lever arm. When attachments are to be used, coverplate 63 is moved away from in front of opening 62 and the end of sleeve 45 is moved into clutching engagement with the end of shaft 50. This may be done by pressing in on knob 48'. Knob 48' is now turned in a counterclockwise direction to turn shaft end 50 whereby the belt will be caused to move from shaft end 50 onto sleeve 45 in the manner already described in connection with Figs. 1 to 4. After the belt end has been transferred to sleeve 45, lever arm 47 is turned in a counterclockwise direction, as viewed from the front of the cleaner to move the lever arm and belt to a position where they are out of line with opening 62. This is indicated in dotted lines in Fig. 8. During this movement, the belt is bent across shaft 60 after the manner indicated in Fig. 9 so as to keep the belt lined upon the brush pulley. When lever arm 47 is moved from the position shown in full lines in Fig. 8 to the position shown in dotted lines, the spring-pressed toggle is moved from the one side of the center line through pivot 53 and the opening in ear 58 to the dotted line position across to the other side of such center line. Recess 65 serves to accommodate knob 49 when lever arm 47 is moved to its dotted line position. Toggle spring now holds the lever arm against shaft 60, as indicated in dotted lines in Fig. 8, to limit movement of the lever in this direction.

A suction or converter tube may now be positioned in the cleaner nozzle after the manner shown in Fig. 3.

To restore the parts to their normal positions, the suction tube or converter is removed from the nozzle, after which lever arm 47 is moved from the dotted line position shown in Fig. 8 back to its full line position where sleeve 45 is in line with shaft end 50. Knob 48' is then pressed inward to connect sleeve 45 to shaft end 50, after which the knob and sleeve are turned in a clockwise direction to cause the belt to run back onto the shaft 8. After the belt is restored

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to the shaft end, the knob is released and cover 62 closed.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a vacuum cleaner having walls which define a suction chamber and a nozzle, said walls being provided with aligned openings to receive a converter tube, a fan shaft having a cylindrical end which projects through one of said openings into the suction chamber in the area between the openings, a rotating cleaning member in said nozzle with its axis at right angles to the fan shaft axis, and a belt connecting the cleaning member to the shaft end, belt removing means comprising a rotatable cylindrical sleeve of substantially the same diameter as the shaft, said sleeve being movable between a position in which it is axially aligned with the shaft end and another position outside of the area between the openings, and means for shifting the belt between said shaft and said sleeve whereby the belt may be readily shifted from the shaft end to the sleeve and moved away from the area between the suction chamber wall openings, to permit the unobstructed insertion of a converter tube in the openings.

2. In a vacuum cleaner with a body having a nozzle, a suction chamber the front and rear walls of which are provided with aligned openings to receive a converter tube, a motor shaft having an end which projects through one of said openings into the suction chamber, a rotating cleaning member in the nozzle, and a belt connecting the cleaning member to the shaft end, belt removing means comprising a pin of substantially the same diameter as said shaft and which stands normally in line with the shaft end, means for transferring the belt from the shaft end axially of the shaft to the pin, and a pivoted member on the cleaner body, said member carrying the pin and being turnable on its pivot to move the belt and pin out of alignment with the openings after the belt has been transferred from the shaft end to the pin.

3. In a vacuum cleaner having walls which define a suction chamber and a nozzle, said walls being provided with aligned openings to receive a converter tube, a motor shaft having an end which projects through one of said openings into the suction chamber, a rotating cleaning member in the nozzle the axis of which is at a right angle to the axis of the shaft end, and a belt connecting the cleaning member to the shaft end, belt removing means comprising a pivoted member on a wall of the suction chamber adapted to be swung from a position in line with said openings to a position out of line therewith, and a rotatable sleeve of substantially the same diameter of said shaft, said sleeve being carried by said pivoted member, said sleeves when the pivoted member is in front of said openings, standing in axial alignment with said motor shaft end whereby by turning the motor shaft the belt may be transferred from the shaft end to the sleeve and by turning the sleeve the belt may be transferred from the sleeve to the shaft end.

4. In a vacuum cleaner having walls which define a suction chamber and a nozzle, said walls being provided with aligned openings to receive a converter tube, a motor shaft having an end which projects through one of said openings into the suction chamber, a rotating cleaning member in the nozzle the axis of which is at a right angle to the axis of the shaft end, and a belt

connecting the cleaning member to the shaft end, belt removing means comprising a pivoted member on a wall of the suction chamber adapted to be swung from a position in line with said openings to a position out of line therewith, a rotatable sleeve of substantially the same diameter as said motor shaft, said sleeve being carried by said pivoted member, said sleeve, when the pivoted member is in front of said openings, standing in line with said motor shaft end in a position to have the belt transferred axially of the shaft from the shaft end to said sleeve, and means for turning the motor shaft and the sleeve for transferring the belt back and forth between the motor shaft end and the sleeve.

5. In a vacuum cleaner having a nozzle with a suction chamber the front and rear walls of which are provided with aligned openings to receive a converter tube, a motor shaft having an end which projects through one of said openings into the suction chamber, a rotating cleaning member in the nozzle, and a belt connecting the cleaning member to the shaft end, belt removing means comprising a rotatable sleeve which stands normally in line with the shaft end and has a diameter substantially the same as said shaft, means for transferring the belt axially of the shaft from the shaft end to the sleeve, a pivoted member which carries the sleeve and is turnable on its pivot to move the belt and sleeve out of alignment with the openings after the belt has been transferred from the shaft end to the sleeve, and a coverplate for the opening in the front wall of the suction chamber.

6. In a vacuum cleaner having a nozzle with a suction chamber the front and rear walls of which are provided with aligned openings to receive a converter tube, a motor shaft having an end which projects through one of said openings into the suction chamber, a rotating cleaning member in the nozzle, and a belt connecting the cleaning member to the shaft end, belt removing means comprising a rotatable sleeve of substantially the same diameter as the shaft and which stands normally in line with the shaft end, means for transferring the belt axially of the shaft from the shaft end to the sleeve, and a pivoted member which carries the sleeve and is turnable on its pivot in a plane at right angles to the axis of the motor shaft to move the belt and sleeve out of alignment with the openings after the belt has been transferred from the shaft end to the sleeve.

7. In a vacuum cleaner having a nozzle with a suction chamber the front and rear walls of which are provided with aligned openings to receive a converter tube, a motor shaft having an end which projects through one of said openings into the suction chamber, a rotating cleaning member in the nozzle, and a belt connecting the cleaning member to the shaft end, belt removing means comprising a pin standing normally in line with the shaft end, means for shifting the belt between said shaft and said pin, a lever arm for the pin pivoted to turn in a plane at right angles to the axis of the shaft for moving the pin out of and into alignment with said shaft end, and a spring pressed toggle for said lever arm.

8. In a vacuum cleaner having a nozzle with a suction chamber the front and rear walls of which are provided with aligned openings to receive a converter tube, a motor shaft having an end which projects through one of said openings

into the suction chamber, a rotating cleaning member in the nozzle with its axis at right angles to the shaft axis, and a belt connecting the cleaning member to the shaft end, belt removing means comprising a lever arm pivoted to turn in a plane at right angles to the axis of said shaft end, a rotatable sleeve carried by the lever arm which stands normally in axial alignment but out of contact with said shaft end, and a knob for moving the sleeve axially into clutching engagement with the motor shaft end and for turning such shaft end to transfer the belt from the shaft end to the sleeve and vice versa.

9. In a vacuum cleaner having a nozzle with a suction chamber the front and rear walls of which are provided with aligned openings to receive a converter tube, a motor shaft having an end which projects through one of said openings into the suction chamber, a rotating cleaning member in the nozzle with its axis at right angles to the shaft axis, and a belt connecting the cleaning member to the shaft end, belt removing means comprising a lever arm pivoted to turn in a plane at right angles to the axis of said shaft end, a rotatable sleeve carried by the lever arm which stands normally in axial alignment but out of contact with said shaft end, a knob for moving the sleeve axially into clutching engagement with the motor shaft end and for turning such shaft end to transfer the belt from the shaft end to the sleeve and vice versa, and spring means for holding said lever arm in a position where the sleeve is in alignment with said shaft end or optionally in a position where the lever arm and sleeve are out of alignment with said openings.

10. In a vacuum cleaner having a nozzle with a suction chamber the front and rear walls of which are provided with aligned openings to receive a converter tube, a motor shaft having an end which projects through one of said openings into the suction chamber, a rotating cleaning member in the nozzle with its axis at right angles to the shaft axis, and a belt connecting the cleaning member to the shaft end, belt removing means comprising a lever arm pivoted to turn in a plane at right angles to the axis of said shaft end, a rotatable sleeve carried by the lever arm which stands normally in axial alignment but out of contact with said shaft end, a knob for moving the sleeve axially into clutching engagement with the motor shaft end and for turning such shaft end to transfer the belt from the shaft end to the sleeve and vice versa, and a member over which the belt bends to hold the belt on the cleaning member when the lever arm is turned to move it and the sleeve out of alignment with said openings.

11. In a vacuum cleaner having a nozzle with a suction chamber the front and rear walls of which are provided with aligned openings to receive a converter tube, a motor shaft having an end which projects through one of said openings into the suction chamber, a rotating cleaning member in the nozzle with its axis at right angles to the shaft axis, and a belt connecting the cleaning member to the shaft end, belt removing means comprising a lever arm pivoted to turn in a plane at right angles to the axis of said shaft end, a rotatable sleeve carried by the lever arm which stands normally in axial alignment but out of contact with said shaft end, a knob for moving the sleeve axially into clutching engagement with the motor shaft end and for turning such shaft end to transfer the belt from

the shaft end to the sleeve and vice versa, a member over which the belt bends to hold the belt on the cleaning member when the lever arm is turned to move it and the sleeve out of alignment with said openings, and means for holding said lever arm in a position wherein the sleeve is in axial alignment with said motor shaft end and in another position wherein said sleeve and lever arm are out of alignment with said openings.

12. In a vacuum cleaner having a nozzle with a suction chamber the front and rear walls of which are provided with aligned openings to receive a converter tube, a motor shaft having an end which projects through one of said openings into the suction chamber, a rotating cleaning member in the nozzle with its axis at right angles to the shaft axis, and a belt connecting the cleaning member to the shaft end, belt removing means comprising a lever arm pivoted to turn in a plane at right angles to the axis of said shaft end, a rotatable sleeve carried by the lever arm which stands normally in axial alignment but out of contact with said shaft end, a knob for moving the sleeve axially into clutching engagement with the motor shaft end and for turning such shaft end to transfer the belt from the shaft end to the sleeve and vice versa,

a member over which the belt bends to hold the belt on the cleaning member when the lever arm is turned to move it and the sleeve out of alignment with said openings, and a spring toggle and stop mechanism for holding said lever arm in a position wherein the sleeve is in axial alignment with said motor shaft end and in another position wherein said sleeve and lever arm are out of alignment with said openings.

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