May 30, 1967 I. JEPSON ETAL 3,321,794

VACUUM CLEANER

Original Filed May 31, 1963 5 Sheets-Sheet 1

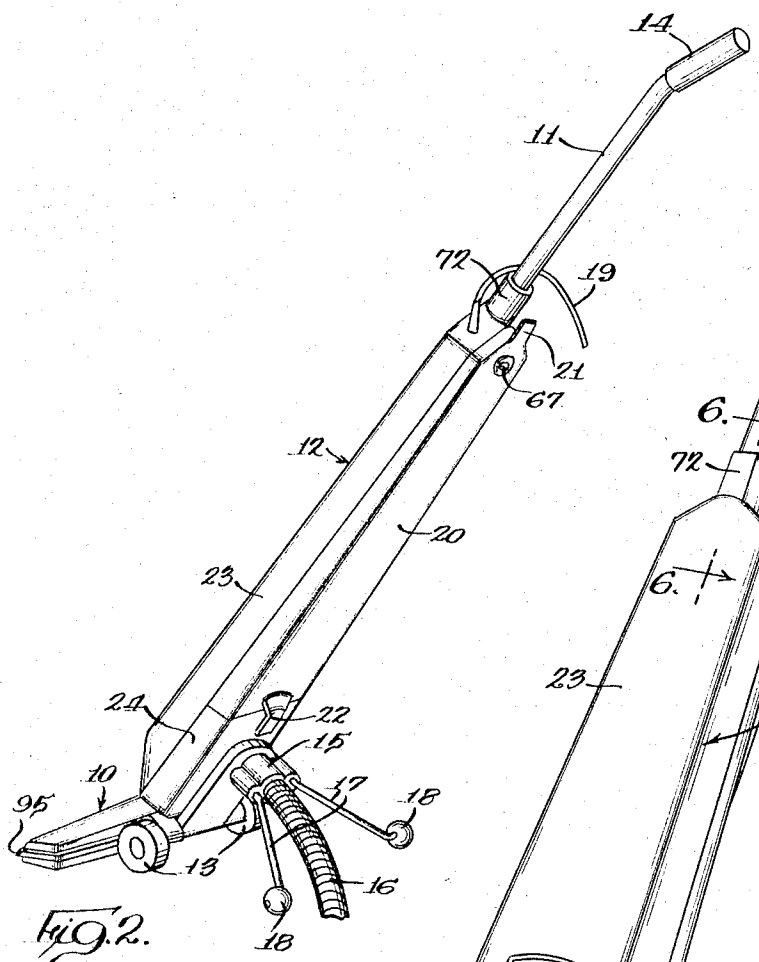


Fig. 2.

Fig. 1.

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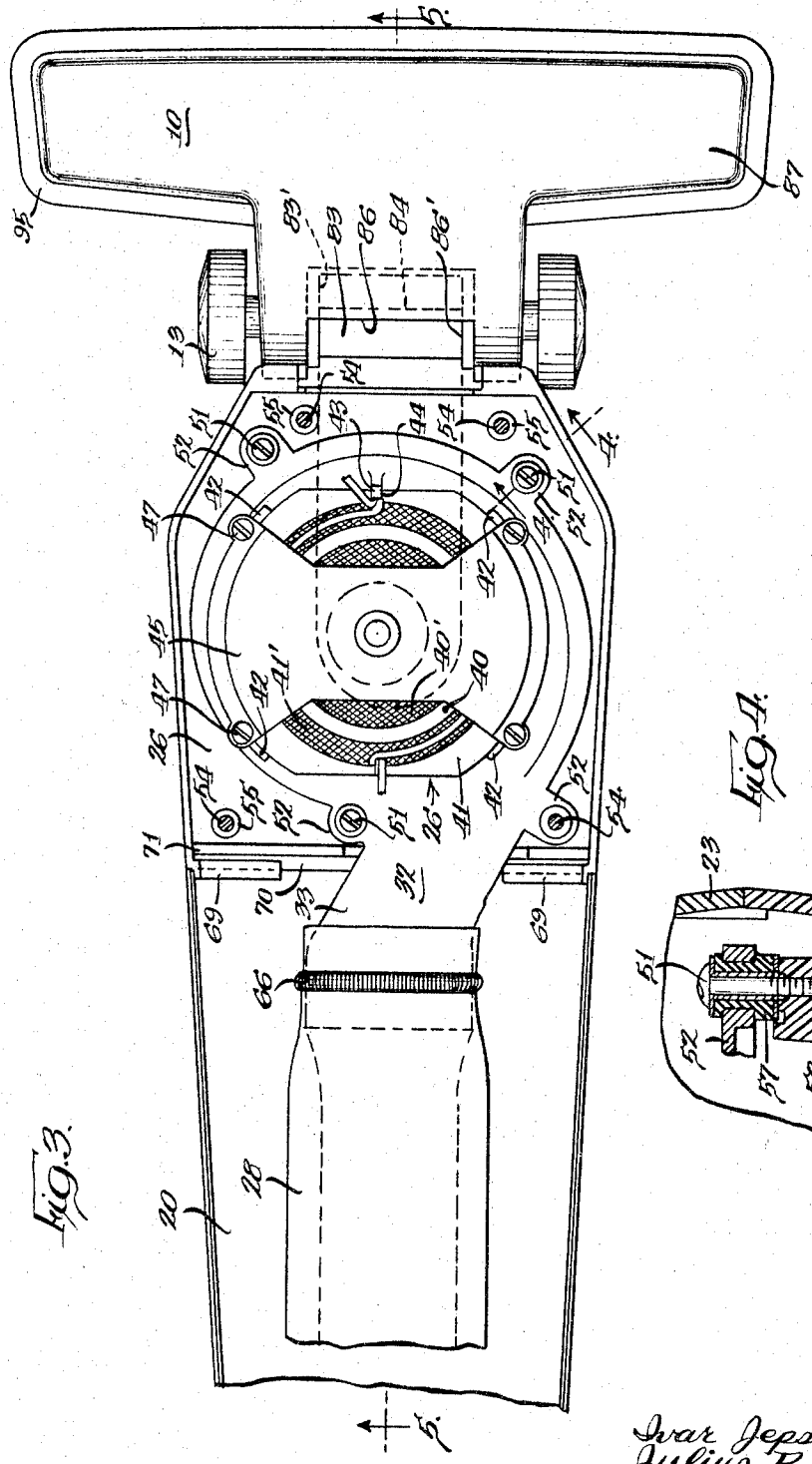


Fig. 3.

Fig. 4.

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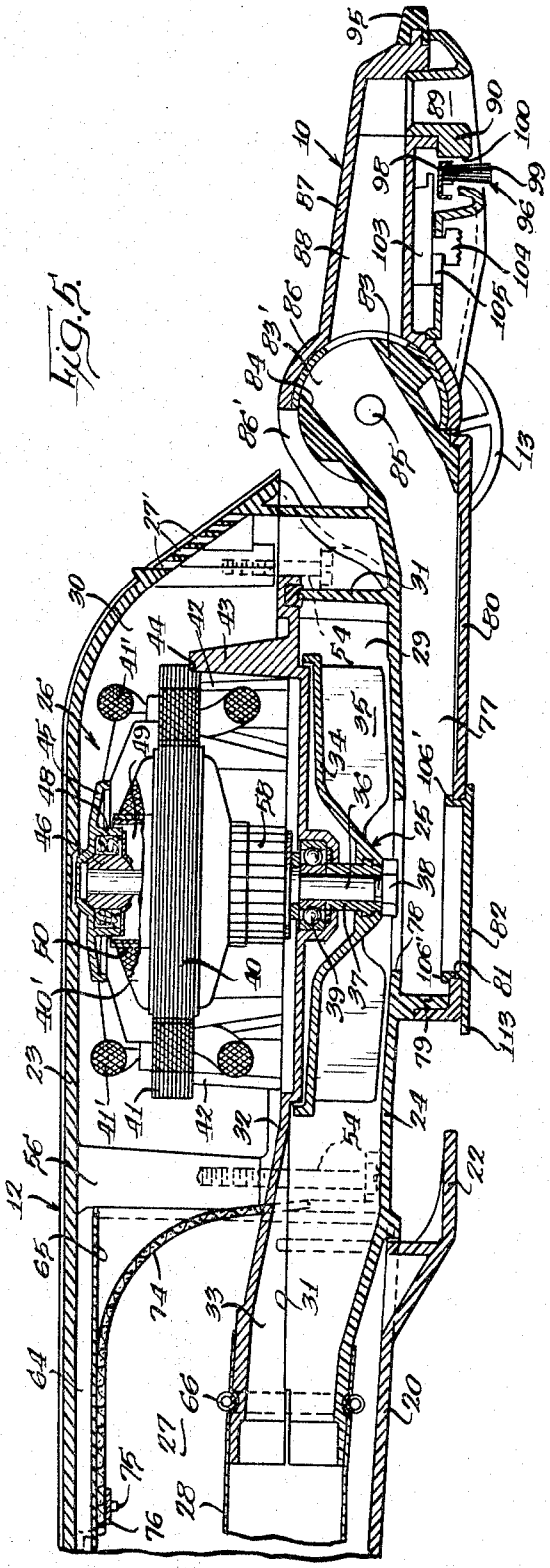


FIG. 5.

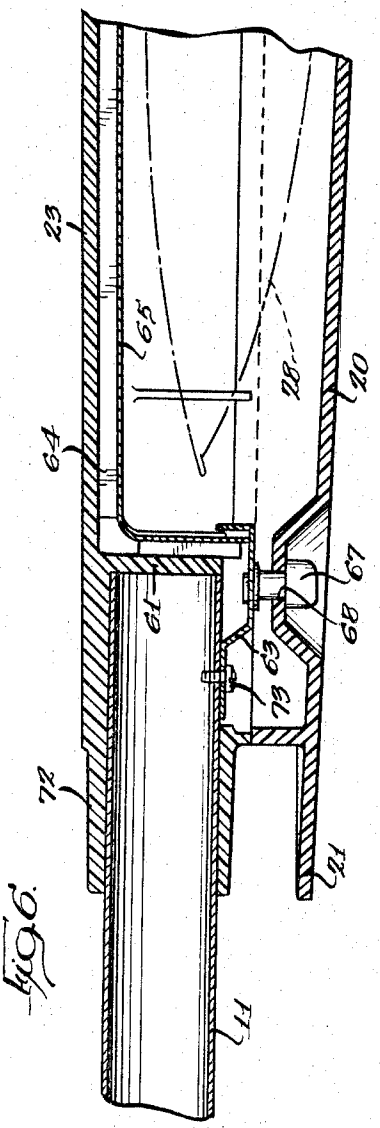


FIG. 6.

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VACUUM CLEANER

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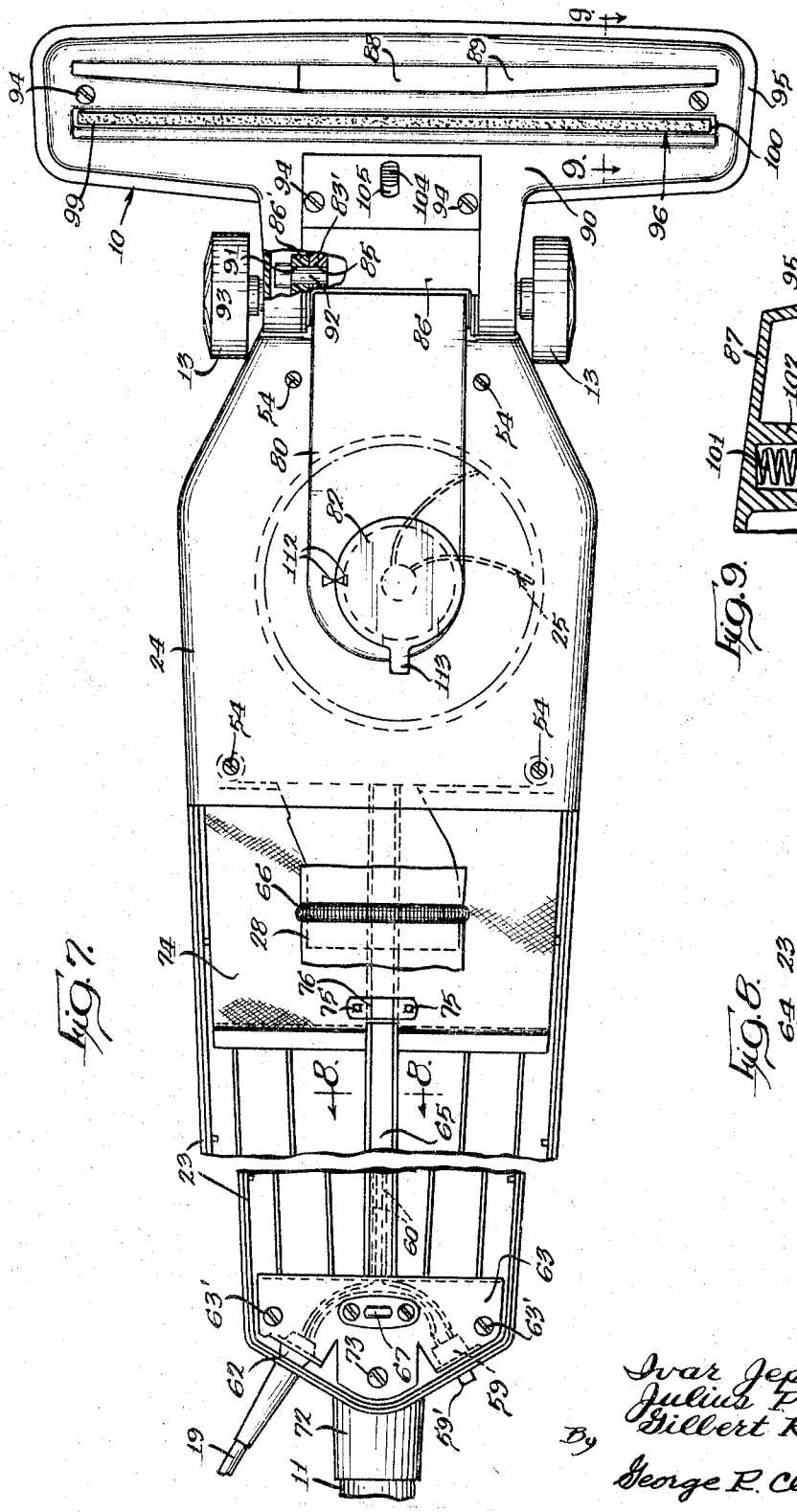


Fig. 7.

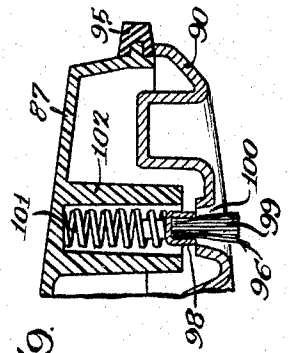


Fig. 9.

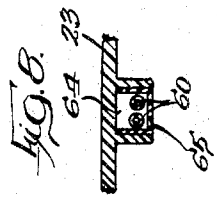


Fig. 6.

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VACUUM CLEANER

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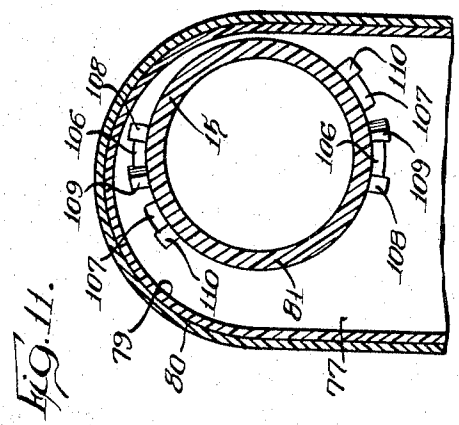


Fig. 11.

Fig. 10.

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United States Patent Office 3,321,794 Patented May 30, 1967

3,321,794

VACUUM CLEANER

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Original application May 31, 1963, Ser. No. 284,441, now Patent No. 3,273,194, dated Sept. 20, 1966. Divided and this application Apr. 11, 1966, Ser. No. 541,588

2 Claims. (Cl. 15—337)

This invention relates to a vacuum cleaner and, more particularly to an upright vacuum cleaner. The instant application is a division of co-pending parent application Ser. No. 284,441 filed May 31, 1963, and issued on Sept. 20, 1966, as Patent No. 3,273,194.

The versatility of the vacuum cleaner is further increased by providing a cleaning tool attachment. The attachment comprises an air hose connector to the air impeller chamber through the back side of the casing, and the connector is provided with floor engaging support means so that the casing is supported in normal upright position when cleaning tool attachments are used. Preferably roller means or wheels are provided at the suction nozzle and floor engaging support means of the air hose connector so that the cleaner can be easily moved in the direction of a pull on the air hose.

The features of the invention which are believed to be novel are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings.

In the drawings:

FIG. 1 is a perspective view of the improved upright vacuum cleaner;

FIG. 2 is another perspective view with the cleaning tool attachment in place;

FIG. 3 is an enlarged top view, partly broken away, and with the top casing member removed;

FIG. 4 is an enlarged sectional view taken along the section line 4—4 of FIG. 3;

FIG. 5 is a sectional view taken along the section line 5—5 of FIG. 3;

FIG. 6 is an enlarged sectional view taken along the section line 6—6 of FIG. 1;

FIG. 7 is an enlarged bottom view, partly broken away, and with the panel of the dust collecting chamber removed;

FIG. 8 is an enlarged sectional view taken along the section line 8—8 of FIG. 7;

FIG. 9 is an enlarged sectional view taken along the section line 9—9 of FIG. 7;

FIG. 10 is an enlarged partly broken away side view with the cleaning tool attachment in place; and

FIG. 11 is a sectional view taken along the section line 11—11 of FIG. 10.

Referring now first to FIGS. 1 and 2 of the drawings, the upright vacuum cleaner comprises a suction nozzle 10 and a handle 11 which are interconnected by an elongated rigid casing 12. Casing 12 is shallow in depth. That is to say, when viewed from the side it is low in height or silhouette as compared to its length and width. Additionally, its top and bottom surfaces are relatively flat or smooth throughout the length thereof.

The forward end of the casing 12 and nozzle 10 are attached to each other by a swivel connection to be described in detail later. This means that the casing 12 can be lowered to get the nozzle far into hard to reach places. The fact that the casing 12 has a low silhouette means that the nozzle 10 can be inserted further under furniture and the like.

The cleaner is supported on a pair of wheels or rollers 13 attached to the nozzle 10 to make it easy to move the device along floors or rugs. The upper end of the handle 11 is provided with a hand grip 14 to manipulate the device.

When it is desired to attach a cleaning tool for drapes, furniture or the like a connector 15 is connected to the device at the back side thereof. The connector 15 has an air hose 16 attached thereto. When connector 15 is attached the device is self-supporting in an upright position. This is because fixed to connector 15 are a pair of floor engaging struts or legs 17. The elements 17 are disposed along opposite sides of the connector 15 and depend therefrom in diverging relationship to the floor at an angle of inclination opposite to the tilted position of the housing 12. The lowermost ends of elements 17 have wheels or rollers 18 so that the device will easily move in the direction of a pull on hose 16.

An electric extension cord 19 is connected to the device at the upper end of casing 12. The upper back side of casing 12 has a removable panel 20 to afford access to the inside of casing 12. A pair of upper and lower hooks 21 and 22, respectively, are formed integrally on panel 20. These hooks 21 and 22 are for the purpose of storing the cord 19 in coiled form on the cleaner.

Referring now also to FIGS. 3 to 7, the casing 12 actually comprises an upper elongated channel-shaped member 23 and a lower one which is split into forward and rear sections 24 and 20, respectively (see FIGS. 2 and 5). That is to say, rear section 20 is also the removable panel 20, and these three parts, 23, 24 and 20 are butted up against each other to form casing 12. These three parts are preferably constructed from molded plastic. The forward section 24 and the forward end of member 23 together define a housing for an air impeller 25 and its motor 26 (see FIG. 5). Air exhaust openings 27' are formed in the forwardmost end of the member 23. The panel or section 20 and the rear portion of member 23 together define a dust collecting chamber 27 in the remainder of casing 12 behind the forward housing portion thereof for air impeller 25 and its motor 26. An elongated dust collecting bag 28 is disposed inside the dust collecting chamber 27.

The forward end or the air impeller and motor housing portion of casing 12 is divided into an air impeller chamber 29 and a motor chamber 30 (see FIG. 5). These chambers 29 and 30 are vertically superposed when the casing 12 is viewed in horizontal position with the motor chamber 30 being uppermost. The air impeller chamber 29 is formed by an integral air impeller chamber scroll wall 31 (see FIG. 5) on the bottom section 24. A cover 32 is provided for the air impeller chamber 29 or its scroll wall 31. This cover 32 comprises the means for dividing the forward end of casing 12 into the chambers 29 and 30 and serves as a mounting plate for motor 26. The

cover 32 is a unitary and relatively flat piece, and integral extensions of parts 24, 31 and 32 together define an exhaust passageway 33 for the chamber 29.

The chamber 29 is shallow and its air impeller 25 is flat. Impeller 25 comprises a disc 34 having blades 35 integrally formed thereon. The air impeller 25 is mounted on the depending end of an armature shaft 36 of motor 26 by an impeller hub collar 37 and nut 38. The depending end of shaft 36 extends through an apertured central portion of cover 32 which is provided with bearing means 39.

The motor 26 comprises the armature shaft 36 and a wound laminated armature 40. Its windings are indicated by reference numeral 40'. The armature 40 is short relative to its diameter. A wound field stator 41 of the motor 26 comprises a short stack of annular laminations whose build is short relative to its diameter. Its windings are indicated by reference numeral 41'. The stator 41 is supported on plate or cover 32 by four integral upstanding projections 42 formed thereon. Another integral projection 43 properly aligns the stator 41 on the projections 42 since projection 43 enters a slot 44 formed in the edge of the stator 41.

The field stator 41 is clamped in position on plate or cover 32 by a member 45 which is also unitary and relatively flat. The member 45 also provides bearing means 46 for the upper end of the armature shaft 36. Member 45 clamps stator 41 on the cover 32 against projections 42 by virtue of four clamping studs 47 extending through not shown aligned openings formed in integral portions of parts 42 and 45. The bearing means 46 is supported on the underside of clamping plate 45 in an integral central depending cup-shaped portion 48. This depending cup-shaped portion 48 and its bearing 46 is positioned in a recess 49 defined within the windings 40' at the end of armature 40 located near plate 45. This recess 49 is defined by a cup-shaped member 50 mounted on shaft 36 against armature 40. This arrangement of the upper bearing 46 within a recess 49 in the corresponding end of the armature 40 makes it possible to give a very low height to the motor 26 and its chamber 30.

In assembling the cleaner, the motor 26 is first assembled and clamped to the air impeller chamber cover 32. Then the air impeller 25 is attached to the depending or lower end of armature shaft 36. Thereafter the assembly of impeller 25, cover 32 and motor 26 is positioned on the scroll wall 31. Three studs 51 are then passed through aligned openings formed in integral portions 52 and 53 of the cover 32 and bottom section 24, respectively, to close the chamber 29 and unite the assembly 25, 32 and 26 with bottom section 24. After this, the upper member 23 can be laid upside down and the motor 26 inserted into the chamber 30. The motor 26 is retained in chamber 30 and bottom section 24 against top member 23 by three studs 54 extending through aligned apertures formed in integral portions 55 and 56 of the section 24 and member 23, respectively. A fourth stud 54 goes through one set of aligned parts 52, 53 and 56. The fourth stud 54 as well as the three studs 51 are surrounded by rubber or the like sound or vibration damping collars 57 (see FIG. 4) which resiliently mount the assembly of 25, 32 and 26 in the casing 12 so that vibrations will not be transmitted thereto to cause it to generate sound or chatter.

The integral portions 52 on member 32 are in the form of apertured ears, and the integral portions 53, 55 and 56 are in the form of bored bosses. A commutator 58 is provided on the shaft 36 immediately below the wound laminated armature 40. A pair of not shown commutator brush assemblies are mounted on the upper surface of impeller chamber cover 32 for cooperation with the commutator 58.

Referring now to FIGS. 6 to 8, the electric control circuit for the vacuum cleaner comprises the electrical extension cord 19, a switch 59, and a pair of electrical leads or wires 60 (see FIG. 8) extending from the cord 19 and switch 59 to the motor 26. The upper end of the casing 12 is partitioned off from the dust collecting chamber 27 by a well 61 (see FIG. 6) which extends integrally across the member 23. The cord 19 is provided with a strain relief 62 and the strain relief 62 and switch 59 are supported by a metallic bracket 63. The bracket 63 closes the partitioned off upper end of member 23 to enclose the strain relief 62 and switch 59 therein. The bracket 63 is connected to the member 23 by studs 63' and serves as a stiffener or reinforcement therefor. An integral channel 64 is formed on the inner surface of member 23. Channel 64 extends lengthwise of member 23 and the electrical leads 60 are disposed therein. Channel 64 is closed by an elongated channel-shaped insulating material strip 65 which is nested with respect to the channel 64. The switch 59 is provided with a control button 59' and suitable apertures are formed in the uppermost end of member 23 for button 59' and cord 19.

Thus, the electrical control circuit for the vacuum cleaner is housed entirely within casing 12 but out of the way of access to the dust collecting bag 28. The bag 28 is connected at its lower end to the exhaust passageway 33 of impeller chamber 29. Periodically the bag will have to be emptied or replaced. The bag 28 is held on exhaust passageway 33 by a coiled annular spring 66.

The panel 20 is locked in closed position by a rotatable flat thumb piece 67 supported off bracket 63. This thumb piece 67 passes through a slot 68 formed on the upper end of panel 20 adjacent the hook 21. In FIG. 6 it is shown in locked position. When it is rotated ninety degrees to the position shown in FIG. 7 it will pass the slot 68 so the upper end of panel 20 can be lifted off member 23. At its lower end the panel 20 has integral projections 69 (see FIG. 3) which engage a shoulder 70 on section 24. The shoulder 70 is defined by the upper edge of section 24 and an integral adjacent cross wall 71 extending between the opposite sides of section 24 and exhaust passageway 33. Interengagement of parts 69 and 70 removably locks the lower end of panel 20 in place.

The handle 11 is detachably connected to casing 12. Referring to FIGS. 6 and 7, the integral tubular portion or socket 72 is formed at the upper end of member 23. Handle 11 fits into socket 72 snugly and is abutted against the wall 61. The strain relief 62 and switch 59 as well as their leads are positioned well out of the way of insertion of handle 11 into socket 72 up against wall 61. Handle 11 is locked in assembled position by a screw 73 extending through aligned apertures formed in integral portions of bracket 63 and handle 11. This screw 73 comprises disconnectable attaching means for handle 11 which is accessible through the panel 20.

Thus, the electrical control means of the cleaner is not affected by disassembly of the handle. The electrical control means comprising parts such as switch 59 and leads 60 is not in the handle but entirely in casing 12. Therefore, handle 11 can be shipped unattached to the casing 12 to conserve on packaging and the customer can simply attach the handle 11 without being concerned with the electric control circuit.

Referring now to FIGS. 5 and 7, the upper member 23 does not have a cross wall as does the bottom section 24 (compare part 71 of FIG. 3). Rather, the dust collecting and motor chambers 27 and 30, respectively, are in open communication with each other. This is so so that the dirt and dust filter clean air which is exhausted by the bag 28 can be used to cool the motor 26. That is to say, the air flow circuit is from the chamber 29 to the bag 28 through passageway 33. Then the air passes through the bag 28 into chamber 27 and then into chamber 30. The air entering chamber 30 passes over motor 26 to cool the same, and is then exhausted to the atmosphere through air vents 27' at hte forwardmost end of member 23. In order to further filter the air exhausted by bag 28 a filter baffle 74 is positioned between chambers 27 and 30 along the wall 71. That is to say, filter 74 extends across the

opening between wall 71 and the underside of member 23. Filter 74 is positioned against the underside of member 23 and then curves therefrom to the wall 71. It is held in place by integral projections 75 formed on the underside of member and a cooperating removable retaining member 76 so that the filter 74 can be removed for cleaning or replacement if necessary.

Referring to FIG. 5, a suction conduit 77 extends from the suction nozzle 10 to an opening 78 formed in the bottom section 24 near the vortex area of the air impeller 25. The conduit 77 is defined by an integral short depending wall 79 formed on the underside of section 24. Wall 79 is curved into a U-shape, and it is closed by a cover 80, see also FIG. 7. Cover 80 is cemented or otherwise permanently fastened to wall 79. The end of cover 80 opposite to opening 78 has an aligned opening 81 formed therein which is covered by a removable closure member 82. This opening 81 is for the purpose of connecting the cleaning tool attachment connector 15 to the opening 78, in a manner to be described in greater detail hereinafter.

The forwardmost end of bottom section 24 and opposite sides of wall 79 have an integrally formed hollow cylindrical swivel member 83, see FIG. 5. Swivel member 83 has a forward slot 84, and apertures 85 in its opposite end walls 83', see FIG. 7.

The swivel member 83 is seated in a semi-cylindrical socket 86 which is integrally formed with an upper member 87 of the suction nozzle 10. The forward slot 84 opens into a suction conduit 88 integrally formed in upper member 87. The conduit 88 extends rearwardly from a suction nozzle opening 89 to the socket 86. The nozzle opening 89 is integrally formed in a bottom member 90 of the suction nozzle 10.

The semicylindrical socket 86 has integral end walls 86' (see FIG. 7) which have apertures 91 formed therein aligned with the apertures 85. Removable bearing pins 92 extend into the aligned apertures 85 and 91 to connect the swivel 83 and socket 86 together into a swivel connection. The axis of the swivel connection coincides with that of the pins 92; that is, the swivel axis is horizontal and crosswise of the upright vacuum cleaner.

The wheels 13 are rotatably mounted on rearward integral extensions 93 of the member 90. When the member 90 is assembled with respect to member 87 the extensions 93 overlie the removable pins 92 to retain them in their apertures 85 and 91. The members 90 and 87 are retained assembled with respect to each other by four screws 94 passing through member 90 into not shown integrally formed depending hollow bosses formed on member 87.

The circumference of the member 87 is fitted with a rubber or the like bumper 95 and the bottom of nozzle 10 has a brush 96 and brush control lock 97 thereon. The brush 96 comprises an elongated and U-shaped brush bristle carrier 98 and brush bristles 99 depending therefrom, see also FIG. 9. An enlongated slot 100 is formed in member 90 for bristles 99. The carrier 98 is positioned above slot 100 and held captive between members 90 and 87 since the spacing between opposite edges of slot 100 is smaller than the corresponding dimension of the carrier 98. Carrier 98 is free floating in an up and down direction between the members 90 and 87 but is also biased downwardly by a pair of springs 101 located in integral hollow depending bosses 102 on the member 87.

A slide 103 of the brush control lock 97 determines the set condition for the brush 96. When the slide 103 is moved in a rearward direction out of engagement with carrier 98 the brush 96 can freely move up or down. When the slide 103 is pushed forward to overlie the carrier 98, then brush 96 is locked down. In this position a substantial length of bristles 99 protrude through opening 100. However, if slide 103 is pushed forward into a position beneath carrier 98 then a much shorter length of bristles 99 protrude through opening 100.

The brush control lock 97 is manually operated by a button 104 integral with slide 103. Slide 103 is assembled between members 90 and 87 and button 104 extends through a slot 105 formed in the member 90. That is, brush control lock 97 is held captive between parts 90 and 87. If it is desired to lock the brush 96 in an up position, the brush 96 is depressed against its spring bias and then the slide 103 is moved to beneath the carrier 98.

Referring now to FIGS. 10 and 11, the hose connector 15 is shown in its position of connection to the opening 78 adjacent the vortex of the impeller 25. In this condition of the cleaner the suction nozzle 10 is inoperative since it is isolated from the impeller 25 by connector 15. Of course, the cover 82 has to be removed from the opening 81 to connect the connector 15. When the connector 15 is withdrawn the opening 81 is reclosed with cover 82.

The connector 15 has a pair of integral diametrically opposite positioned lugs 106 which will pass through a pair of diametrically opposite positioned notches 107 formed on the edge of opening 81. When lugs 106 and notches 107 are aligned, the connector 15 is inserted into opening 78 and turned to move the lugs 106 against a pair of diametrically opposite positioned stops 108 formed adjacent to the edge of opening 81. A slight rise 109 is formed on the edge of opening 81 between notches 107 and stops 108 to removably lock the lugs 106 against stops 108. Another pair of stops 110 are formed immediately adjacent to notches 107 so that when the connector 15 is turned in an opposite direction the lugs 106 are brought into correct alignment with notches 107 for withdrawal of the connector 15. Actually, one of the lugs 106 and notches 107 are made smaller than the others so that the connector 15 can be only correctly installed, which is the position shown in FIG. 10 with the struts 17 directed down toward the floor indicated by reference numeral 111. This is also the position attained when the lugs 106 abut the stops 108. The connector 15 cannot be turned in the incorrect direction to install it since stops 110 adjacent openings 107 prevent this.

The closure member 82 operates with regard to opening 81 in the same manner as connector 15. That is, closure member 82 is provided with a pair of lugs 106' (see FIG. 5) similar to the lugs 106 of connector 15. When the two indicator triangles 112 (see FIG. 7) stamped on the parts 80 and 82 are aligned, the part 82 is removably locked with respect to part 80. An integral tab 113 is formed on part 82 to facilitate operating it. To turn it open or closed, as in the case of connector 15, it has to be turned only a few degrees.

While there has been shown and described a particular embodiment of the invention, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention, and that it is intended by the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. In an upright-type vacuum cleaner comprising a floor engaging suction nozzle, a stick-type handle, and an elongated rigid box-type housing having motor-driven suction creating means contained therein at one end thereof and dirt collecting means therein at the other end thereof, a swivel connection between said nozzle and said one housing end, said handle being connected to said other housing end for manually pushing said vacuum cleaner along a floor with said nozzle being engaged with said floor and said housing being in an upright tilted position with respect to said floor, whereby said one and other housing ends are the lower and upper ends respectively of said housing during on-the-floor cleaning with said vacuum cleaner; the improvement of means for retaining said vacuum cleaner in its mentioned on-the-floor cleaning position while performing off-the-floor cleaning therewith, said improvement comprising a removably covered opening formed in the back side of said housing at its

lower end for connecting an air hose to said suction creating means, said opening being formed in said housing at a location vertically above said swivel connection, a rigid tubular connector, the inner end of said connector being insertable into said opening for connection with said suction creating means, a flexible elongated air hose, one end of said air hose being connected to the other end of said tubular connector and the other end of said air hose being adapted to have off-the-floor cleaning fittings attached thereto, and a pair of elongated support struts connected to said tubular connector along opposite sides of said hose, said struts extending from said tubular connector to the floor at an angle of inclination opposite to the tilted position of said housing.

2. In an upright-type vacuum cleaner as in claim 1,

the further improvement of a pair of floor engaging wheels on said nozzle adjacent said swivel connection and a floor engaging wheel at the lower end of each of said struts to assist in movement of said vacuum cleaner along a floor during on and off-the-floor cleaning use thereof.

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