

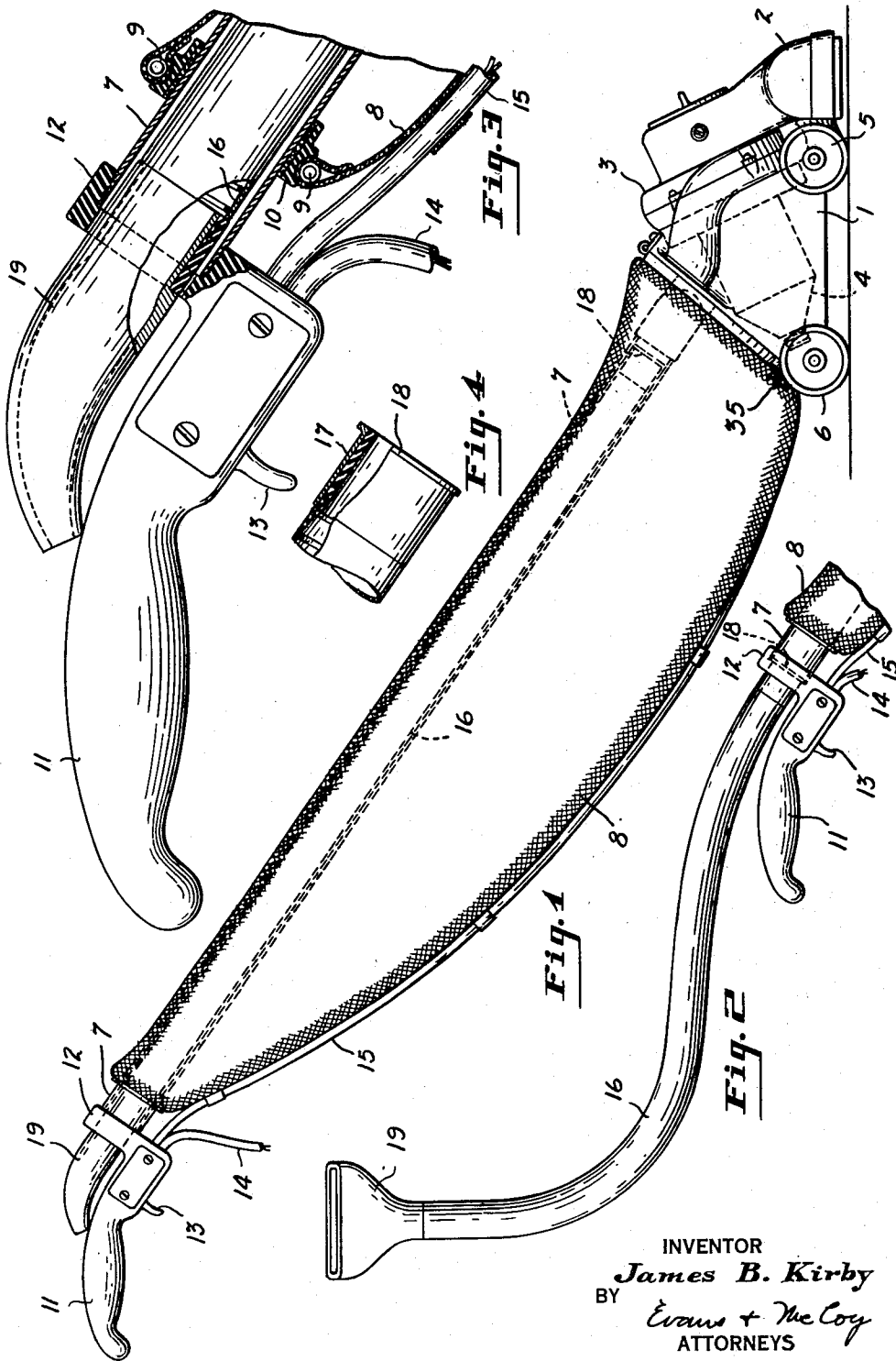
April 18, 1950

J. B. KIRBY
VACUUM CLEANER WITH AUXILIARY SUCTION TUBE AND
AUTOMATICALLY CONTROLLED BRUSH DRIVE

2,504,846

Filed Aug. 16, 1944

3 Sheets-Sheet 1



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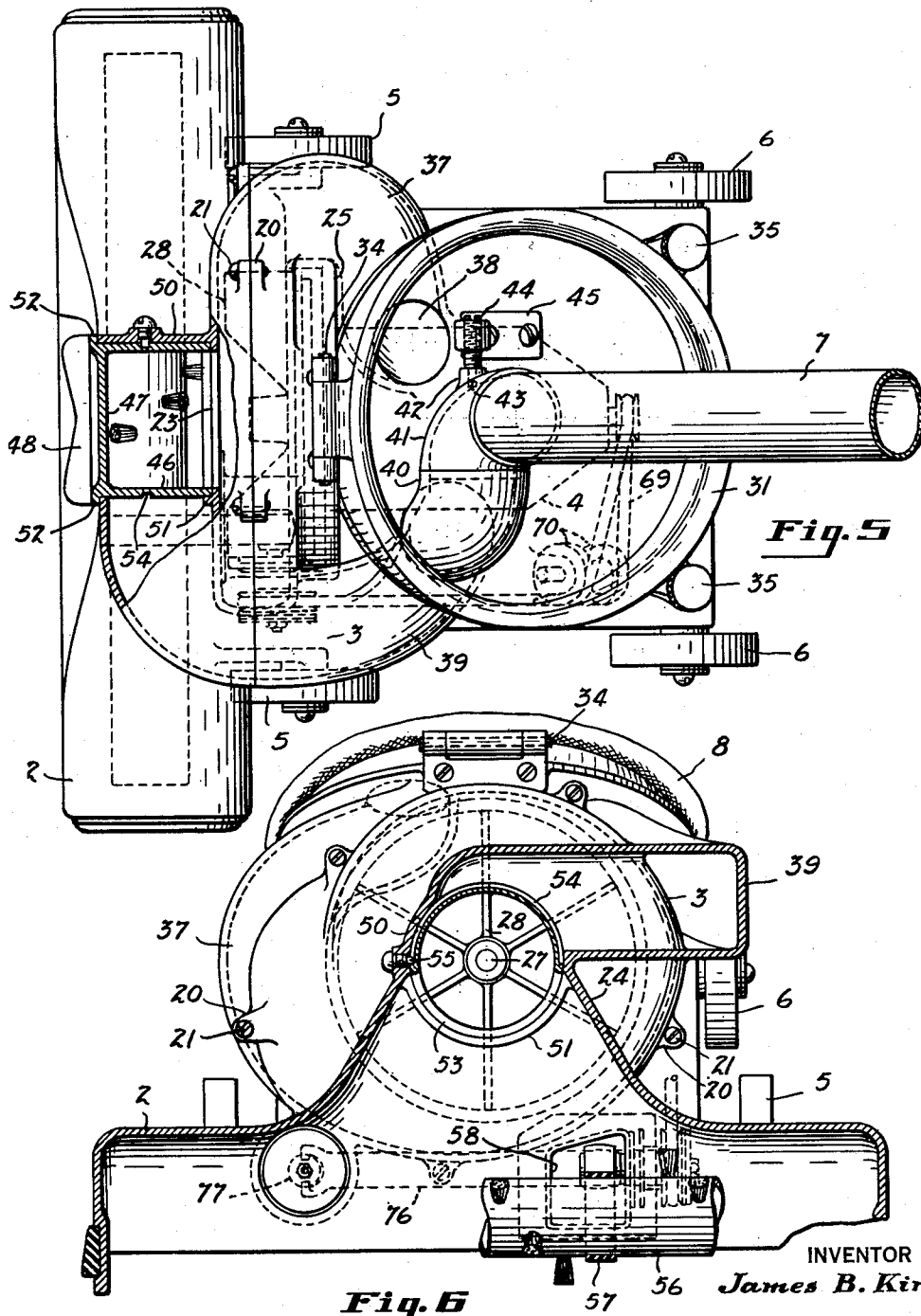


Fig. 6

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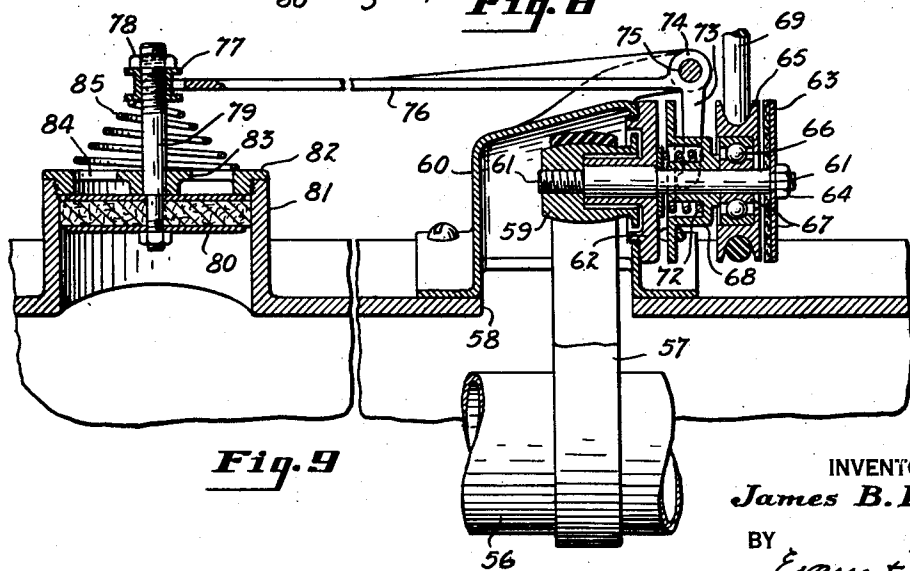
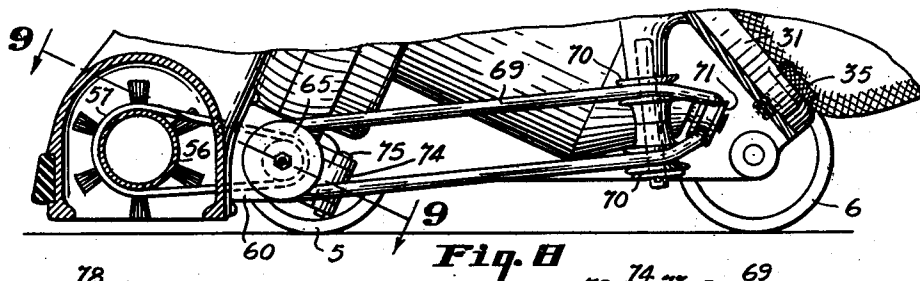
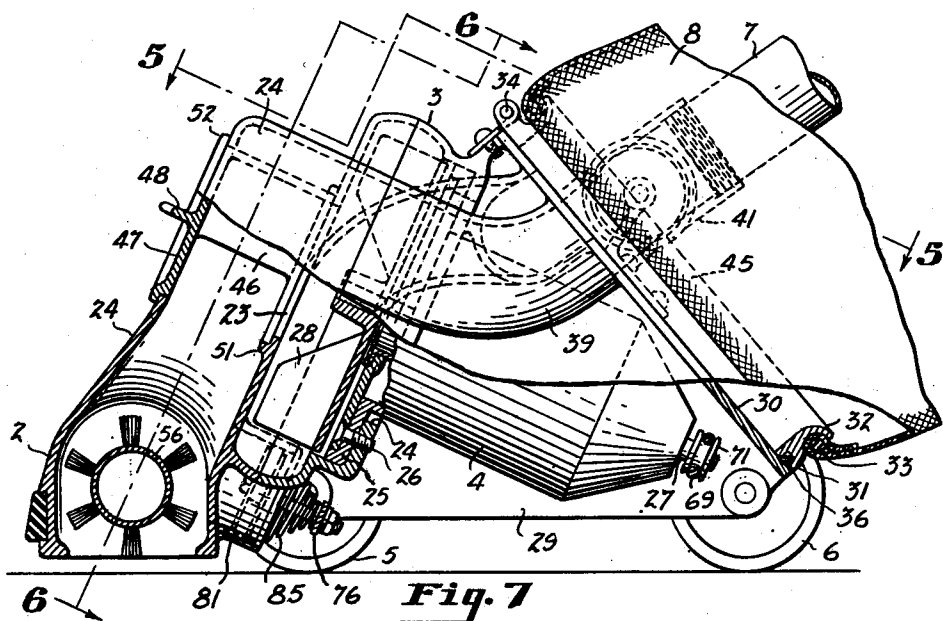
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VACUUM CLEANER WITH AUXILIARY SUCTION TUBE AND AUTOMATICALLY CONTROLLED BRUSH DRIVE

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5 Claims. (Cl. 15-319)

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This invention relates to vacuum cleaners of the type having a dirigible head that carries a floor cleaning suction nozzle and suction creating means and that has a pivoted handle by means of which the head may be pushed along a floor surface.

Vacuum cleaners of the type referred to are usually provided with a rotary brush in the floor nozzle that is driven by a belt from the fan shaft. Such cleaners have sometimes been provided with a flexible hose attachment for an auxiliary furniture cleaning nozzle that is adapted to be connected to the suction inlet of the fan casing and cut off communication between the suction inlet and the floor nozzle. Such auxiliary suction nozzle attachments have been inconvenient because of the fact that the attachment is a spare part not carried by the cleaner, and because connecting the flexible tube to the cleaner is difficult by reason of the necessity of disconnecting the brush driving belt from the fan shaft before making the connection.

An important object of the present invention is to provide a cleaner of the type referred to with an auxiliary suction tube and nozzle that is permanently connected thereto and with adjustable means for connecting either the floor nozzle or the auxiliary nozzle to the suction inlet of the fan casing.

A further object of the invention is to provide a means for disconnecting the main nozzle from and connecting the tubular handle to the suction creating means.

An additional object of the invention is to provide a vacuum cleaner having a main suction nozzle and an auxiliary suction nozzle and a valve for connecting the suction creating means to either nozzle.

It is also an object of the invention to provide a cleaner having a valve controlled auxiliary nozzle with a power driven brush in the main nozzle which is controlled by the valve.

It is also an object of the invention to provide a power driven brush for the suction nozzle that is controlled by the pressure within the nozzle so as to be driven only when there is a vacuum within the suction nozzle.

With the above and other objects in view, the invention may be said to comprise a vacuum cleaner as illustrated in the accompanying drawings, hereinafter described and particularly set forth in appended claims, together with such variations and modifications thereof as will be apparent to one skilled in the art to which the invention pertains.

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Reference should be had to the accompanying drawings forming a part of this specification, in which:

Fig. 1 is a side elevation of a vacuum cleaner embodying the invention;

Fig. 2 is a fragmentary side elevation of a flexible suction tube that is telescopically mounted in the handle of the cleaner;

Fig. 3 is a fragmentary side elevation on an enlarged scale, showing the outer end portion of the handle, with a portion of the handle, filtering bag and extension tube broken away and shown in section;

Fig. 4 is a fragmentary side elevation of the inner end of the flexible suction tube, a portion of the guide ferrule being broken away and shown in section;

Fig. 5 is a top plan view of the vacuum cleaner head with a portion of the housing broken away and shown in section;

Fig. 6 is a section taken on the line indicated at 6-6 in Fig. 7;

Fig. 7 is a side elevation of the suction head with the lower portion thereof broken away and shown in central vertical section;

Fig. 8 is a fragmentary vertical section through the lower portion of the suction head, and

Fig. 9 is a section taken on the line indicated at 9-9 in Fig. 8.

As shown in Fig. 1, the vacuum cleaner of the present invention has a suction head provided with a housing 1 that is provided with a wide floor nozzle portion 2 at its forward end and which has an inclined fan casing 3. A motor housing 4 carried by the fan casing 3 projects rearwardly from the fan casing within the housing 1. The suction head is supported upon front and rear wheels 5 and 6 mounted on the housing 1, the front wheels 5 being mounted behind the end portions of the nozzle 2 and the rear wheels 6 being mounted on the rear end of the housing 1. The suction head is pushed over the floor surface by means of a tubular handle 7 that is pivotally connected to the housing 1 and the handle 7 provides a support for a filtering bag 8. The handle 7 extends through a filtering bag 8, the bag having an opening at its rear end that is provided with a resilient bead 9 that snaps into engagement with a grooved collar 10 mounted on the handle 7 adjacent its upper end. The bead 9 forms a dust tight joint between the bag 8 and collar 10 and the collar 10 has a dust tight sliding connection with the handle 7, air pressure within the bag during operation of the cleaner serving

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to hold the collar 10 near the outer end of the handle.

A hand grip 11 is attached to the outer end of the tubular handle 7 and is offset beneath the outer end of the tubular handle 7, the hand grip 11 having a laterally projecting attaching portion 12 which is secured upon the end of the tubular handle 7. The hand grip 11 carries a trigger switch 13 that controls the current supplied to the fan driving motor through an extension cord 14 and an insulated cable 15 extending from the switch 13 to the motor and attached to the under side of the filtering bag 8. A flexible tube 16 is telescopically mounted in the tubular handle 7, the inner end of the tube being provided with a rigid guide ferrule 17 having a flange 18 at its inner end which has a sliding fit within the tubular handle 7. The flange 18 also serves as a stop to limit the outward movement of the tube 16, being engageable with the attaching portion 12 of the hand grip when the flexible tube 16 is withdrawn to its full extent. The tube 16 carries an auxiliary nozzle 19 at its outer end which is adapted to be used for cleaning furniture, walls and woodwork and the like, means which will be hereinafter described being provided for connecting the tubular handle to the inlet of the fan casing. The tube 16 is normally retracted within the handle 7 and the nozzle 19 overlies the switch carrying portion of the hand grip 11.

The housing 1 is divided into front and rear sections which are joined substantially in a central plane with the fan casing, the two sections being provided with attaching lugs 20 which receive bolts 21 which clamp the two sections together. The fan casing 3 has a central inlet opening 22 in the front wall thereof which communicates with a passage 23 extending upwardly from the center of the floor nozzle 2. The fan casing 3 also has a central opening in its rear wall which is of a diameter sufficient to receive the motor housing 4 which is adapted to be inserted in the opening in the rear wall of the fan casing before the front and rear housing sections are secured together, the motor housing 4 being provided with a marginal flange 25 at its forward end, which engages the interior of the fan casing wall around the opening 24, the flange 25 being secured to the fan casing by suitable means such as screws 26. The motor in the housing 4 has a shaft 27 that projects into the fan casing 3 where a fan 28 is secured thereto.

The forward section of the housing 1 is a casting which forms the floor nozzle 2 and the forward half of the fan casing 3. The rear section of the housing forms the rear half of the fan casing and has integral side skirts 29 extending rearwardly from the opposite side portions of the fan casing 3 which cover opposite sides of the motor housing 4. The side skirts 29 are substantially triangular in form, tapering from a wide base to an apex immediately behind the top of the fan casing 3, and the housing has an inclined rear wall 30 connecting the rear ends of the side skirts 29. A filtering bag mounting ring 31 is mounted upon the rear end of the housing 1 and has an outwardly curved retaining flange 32 which provides an external recess to receive a contractible, resilient bead 33 surrounding the forward opening of the filtering bag 8. The mounting ring 31 is connected to the housing 1 by means of a hinge 34 adjacent the top of the housing, and is detachably secured in place against the face of the wall 30 by means of screws 35 which are carried by the ring and screwed into threaded open-

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ings in the wall 30 adjacent the lower edge thereof. The ring 31 is held tightly against the face of the wall by means of screws 35 and leakage of air between the ring and wall is prevented by means of a sealing ring 36 mounted in the face of the ring 31 which engages with the wall 30.

The fan casing 3 has an outlet passage 37 which extends tangentially of the casing 3 and along one side of the casing to an opening 38 in the wall 30 which lies within the mounting ring 31 and near the top of the wall 30. In normal operation of the machine, the air drawn through the suction nozzle 2 passes through the fan and is discharged to the filtering bag 8 through the opening 38. Since the dirt laden air passes into the bag near the top of the mounting ring 31, the dirt can accumulate on the portions of the wall 30 and of the bag 8 adjacent the lower portion of the ring, and the bag may be emptied by releasing the screws 35 and lifting the lower portion of the ring off the wall 30 after the bag has been shaken to deposit the dirt in the lower end thereof.

An auxiliary conduit 39 extends laterally around the side of the fan casing 3 opposite that around which the discharge passage 37 extends and is connected to the passage 24 leading from the floor nozzle 2 to the inlet of the fan casing 3. The conduit 39 extends through the wall 30 and terminates in a laterally facing bearing portion 40 in which a pipe elbow section 41 is rotatably mounted. The elbow section 41 is attached to the inner end of the tubular handle 7 and turns in the bearing portion 40 when the handle is swung upwardly or downwardly. The elbow section 41 has a boss 42 which is centrally disposed with respect to the bearing portion 40 and which receives a pivot pin 43 that is axially aligned with the bearing portion 40. The pivot pin 43 is carried by the inner end of a screw 44 that is adjustable in a bracket 45 attached to the wall 30. Screw 44 serves to press the elbow 41 against the bearing portion 40 and the pivot pin 43 keeps the elbow centered with respect to the bearing portion. When it is desired to remove the handle, screw 44 may be opened to retract the pin 43 and allow the elbow 41 to be moved laterally out of engagement with the bearing portion 40.

In order to control the flow of air through the main nozzle 2 and the auxiliary nozzle 19, a two-way valve 46 is provided at the junction of the passages 24 and 39. The valve 46 is a drum valve having a cylindrical body portion extending from the front wall of the passage 24 to the fan casing, the valve being open at its inner end to the inlet opening of the fan casing and having a closed outer end 47, which is provided with a diametrical flange 48 which forms a handle by means of which the valve may be turned. The body portion of the valve 46 is rotatably mounted in a bearing portion 50 of the housing 1, in the opening of the front wall within which the valve fits and within an arcuate flange 51 adjacent the margin of the inlet opening 23. The valve 46 has a flange 52 at its outer end which engages with the front wall of the housing around the valve receiving opening and the body of the valve has an arcuate peripheral opening 53 which extends through nearly half the circumference of the valve. The valve is held against axial movement and its angular movement limited by means of a groove 54 in its periphery which is engaged by a pin 55 carried by the bearing portion 50 of the housing. The groove 54 is substantially 180° in length to permit movement of the valve from the

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extreme position shown in Fig. 6, where the auxiliary passage 39 is closed and the passage 24 to the suction nozzle 2 is open, to the opposite extreme position in which the suction nozzle 2 is cut off from the suction fan and the tubular handle 7 is connected to the fan casing inlet through the passage 39. Whenever it is desired to use the auxiliary nozzle 19 the valve 46 is turned by means of the hand grip flange 48 to connect the handle 7 to the fan casing inlet. The fan then draws air through the handle 7 and the nozzle 19 and tube 18 that is telescopically received in the handle 7. The operator may then pull the flexible tube 18 out of the handle 7 and pass the nozzle 19 over objects to be cleaned, using the flexible tube 18 to drag the cleaner along the floor.

The suction nozzle 2 is preferably provided with a rotary brush 56 that is operated by the fan motor, and since it is not desirable to have the brush 56 operated while the suction nozzle 2 is disconnected from the fan casing, means is provided for controlling the brush driving means by the valve 46. As shown in Figs. 8 and 9, the brush 56 is driven by means of a belt 57 which extends through an opening 58 in the rear wall of the floor nozzle 2 and over a pulley 59 that is mounted within a housing 60 attached to the rear wall of the suction nozzle 2, the housing 60 forming a recess in the suction nozzle adjacent the nozzle opening to receive the driving pulley 59. The driving pulley 59 is attached to the inner end of a horizontal shaft 61 that is supported in a bearing member 62 mounted in a side wall of the housing 60. The shaft 61 projects past the outer face of the bearing member 62 and has a friction disk 63 clamped to its outer end by means of a nut 64. Between the friction disk 63 and the housing 60 the shaft 61 carries a pulley 65 which is freely rotatable on ball bearings 66 interposed between the pulley 65 and the shaft 61. The ball bearing 66 has an inner race ring 67 that is slidable on the shaft 61 and this race ring is engaged by a shifter collar 68, also slidable on the shaft and mounted between the pulley 65 and the bearing member 62. The pulley 65 is continuously driven during the operation of the cleaner by a belt 69 that extends over the pulley 65 over guide pulleys 70 carried on the housing 1 and over a driving pulley 71 attached to the rear end of the motor shaft 27. Collar 68 is pressed outwardly by a spring 72 interposed between the collar and the bearing member 62 and its outward movement is restrained by an arm 73 of a shifter lever 74 connected to the housing 60 by a pivot 75 and having a long arm 76 substantially parallel with the rear wall of the suction nozzle. The outer end of the arm 76 engages a collar 77 that is held against the inner side of a nut 78 on a stem 79 attached to a plunger 80 that is slidably mounted in a cylindrical chamber 81 formed in the rear wall of the suction nozzle and open at its inner end to the interior of the nozzle. A head 82 is screwed into the outer end of the chamber 81. This head is in the form of a spider having a central hub portion 83 through which the stem 79 extends and in which the stem 79 has a sliding fit. Around the hub portion 83 the spider is provided with a series of holes 84 which open the outer portion of the chamber to atmosphere. A spring 85 interposed between the spider 82 and the collar 77 normally holds the collar 77 against the nut 78 and the spring 85 is of sufficient strength to hold the

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collar 68 in retracted position where the pulley 65 is free from the friction disk 63, the plunger 80 being normally held against the spider 82, as shown in Fig. 9.

When the nozzle 2 is connected to the fan casing inlet and the fan is operated with the nozzle 2 in engagement with a carpet, a vacuum is created in the suction nozzle 2 which causes the plunger 80 to move inwardly, and operates the lever 74 to shift the arm 73 outwardly, releasing the collar 68 and permitting the spring 72 to press the pulley 65 against the friction disk 63, so that, as soon as an effective vacuum is established in the nozzle 2, the brush 56 will be automatically connected to the driving motor. However, when the valve 46 is shifted to close the passage between the suction nozzle 2 and the fan inlet, the operation of the fan will have no effect upon the brush driving mechanism for the reason that no vacuum will be created in the suction nozzle. The automatic control of the brush driving mechanism is advantageous in the normal operation of the cleaner on a floor surface since it relieves the initial load on the driving motor, due to the fact that the driving connection to the brush is established only after an operating vacuum is established in the suction nozzle. This reduces the initial load on the motor, which operates first to bring the fan up to speed before the brush operating torque is imposed upon the motor shaft.

It is to be understood that variations and modifications of the specific device herein shown and described for purposes of illustration, may be made without departing from the spirit of the invention.

What I claim is:

1. A suction cleaner comprising a fan casing having a suction inlet, a suction nozzle connected to said inlet, a fan in said casing, a motor for driving said fan, a brush in said nozzle, a driving connection from said motor to said brush including a clutch comprising two friction elements one movable toward and away from the other, a spring pressing said movable element toward engaging position, a second spring pressing said movable element in the opposite direction and normally holding the same in disengaged position, and means operated by suction in said nozzle for decreasing the pressure exerted by said second spring on said movable element so as to permit the first spring to engage the clutch elements.

2. A suction cleaner comprising a fan casing having a suction inlet, a suction nozzle connected to said inlet, a fan in said casing, a motor for driving said fan, a brush in said nozzle, a driving connection from said motor to said brush including disengageable driving elements, means for normally holding said elements disengaged, and a fluid pressure operated member operably connected to said nozzle and to one of said driving elements and movable in response to suction in said nozzle for engaging said driving elements.

3. A suction cleaner comprising a fan casing having a suction inlet, a suction nozzle connected to said inlet, a fan in said casing, a motor for driving said fan, a brush in said nozzle, a driving connection from said motor to said brush, a clutch in said driving connection, a spring normally holding said clutch in disengaged position, and a member operably connected to the nozzle and to said clutch and movable in response to suction in said nozzle for

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engaging said clutch in opposition to said spring.

4. A suction cleaner comprising a fan casing, a suction conduit connected to the casing inlet, a suction nozzle connected to said conduit, a fan in said casing, a motor for driving said fan, a branch conduit connected to said suction conduit, means for connecting the branch conduit to the casing inlet and cutting off the suction nozzle, a brush in said nozzle, a rotatable member driven by said motor, means including a shiftable member for establishing a driving connection from said rotatable member to said brush, and a fluid pressure operated member operably connected to the nozzle and to said shiftable member and adapted to be moved by suction in said nozzle for operating the shiftable member to establish a driving connection between said rotatable member and said brush.

5. In a suction cleaner, a head comprising a fan casing, a motor housing carried by the fan casing and a suction nozzle connected to the fan casing inlet, a motor shaft projecting from opposite ends of the motor housing, a fan attached to one end of said shaft, a rotatable brush in said nozzle, a driving connection from the end

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of said motor shaft opposite that to which the fan is attached to said brush, a clutch controlling said driving connection, and a clutch actuator operably connected to said nozzle and clutch and movable in response to suction in said nozzle in a direction to engage said clutch.

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