Dec. 13, 1938. W. D. SELLERS ET AL 2,140,143

SUCTION CLEANER

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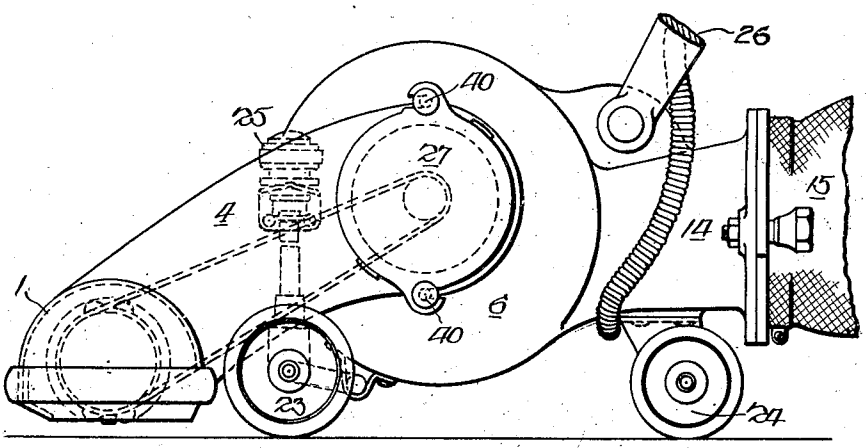


Fig. 1.

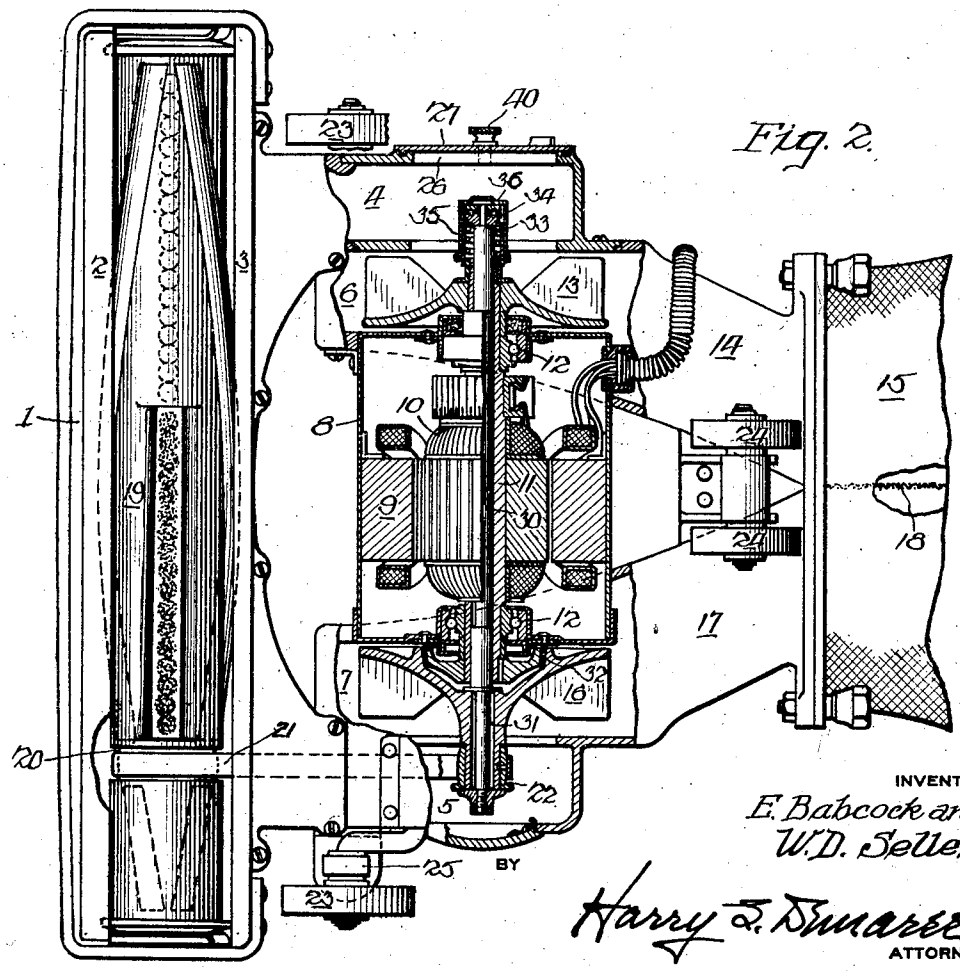


Fig. 2.

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SUCTION CLEANER

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Fig. 3.

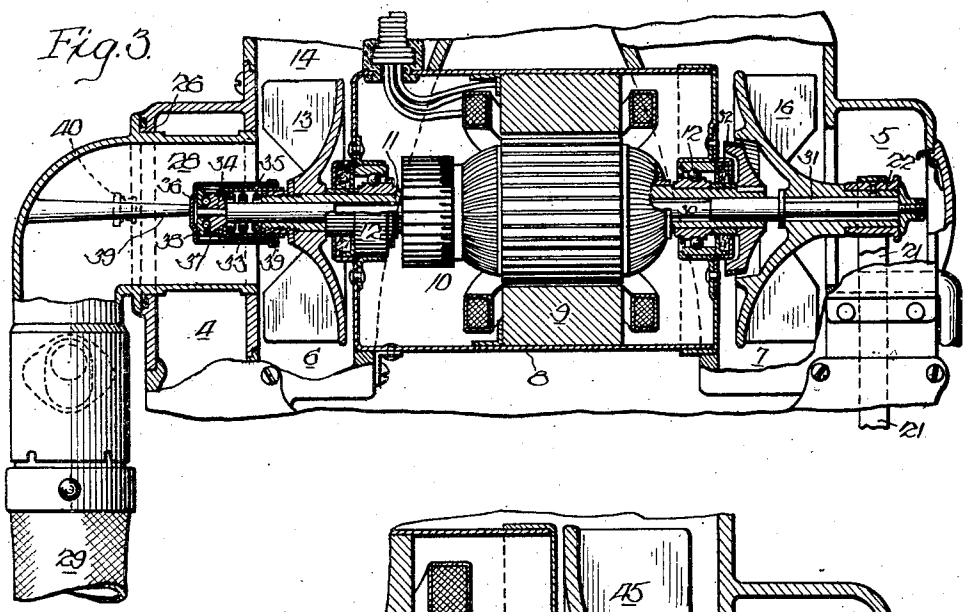
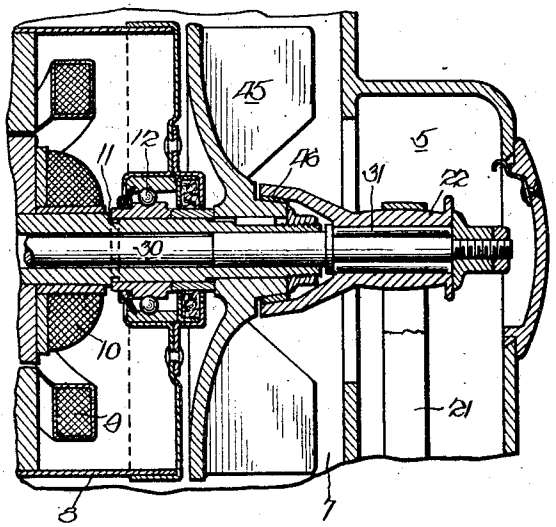


Fig. 4.



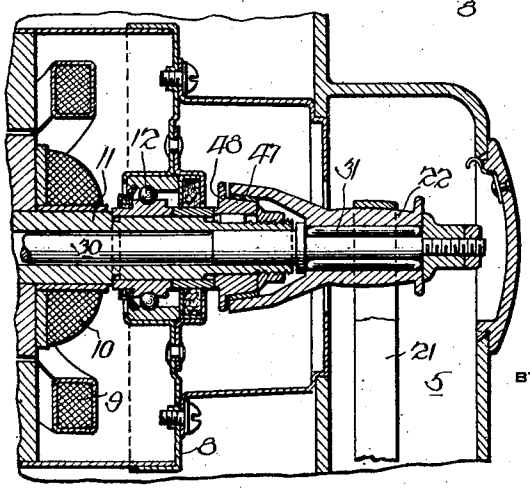


Fig. 5.

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SUCTION CLEANER

Filed Dec. 30, 1933 3 Sheets-Sheet 3

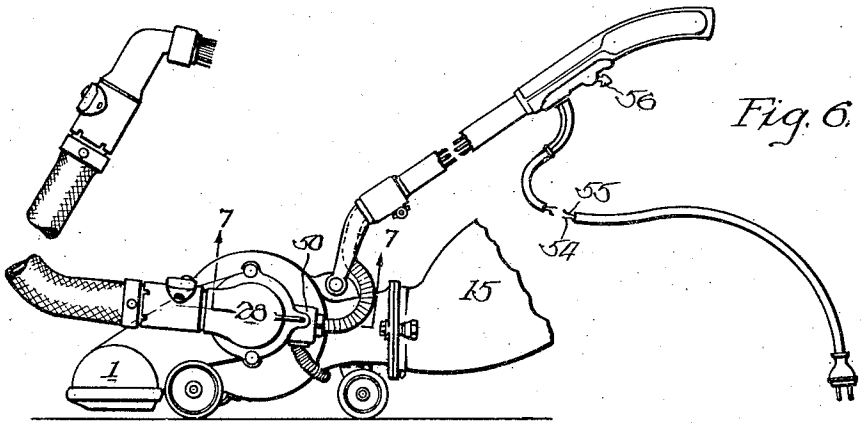


Fig. 6.

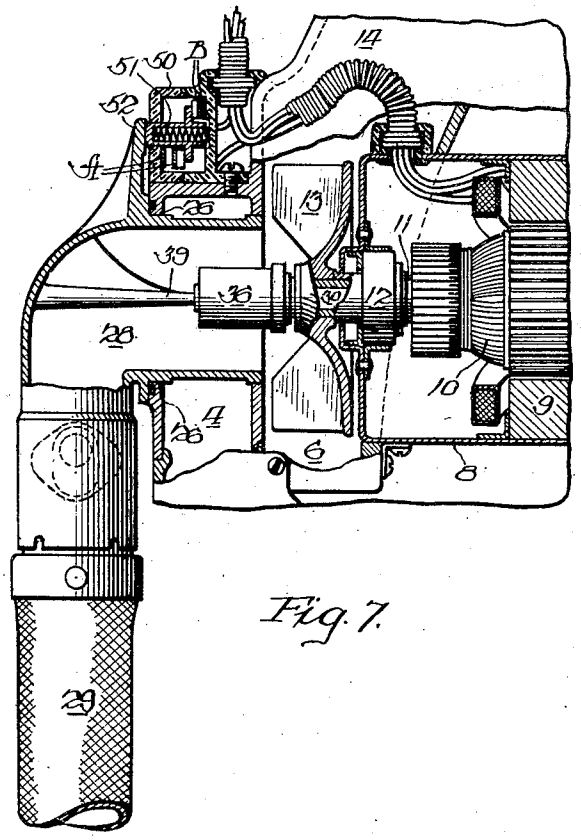


Fig. 7.

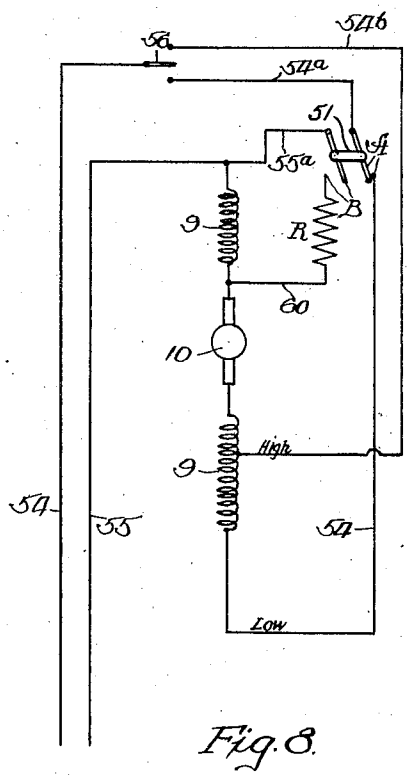


Fig. 8.

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UNITED STATES PATENT OFFICE

2,140,143

SUCTION CLEANER

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Application December 30, 1933, Serial No. 704,624

27 Claims. (Cl. 15—9)

The present invention relates to suction cleaners in general and particularly to new and novel improvements in suction cleaners adapted for use with dusting tools. More specifically, the invention comprises a suction cleaner construction in which a plurality of fans and a surface-contacting agitator are driven by a motor, there being means to disconnect the agitator and a suction-creating fan from the driving motor when dusting tools are connected to the cleaner, at least one fan remaining connected to the cleaner for the purpose of providing suction for the dusting tools.

It is an object of the present invention to provide a new and improved suction cleaner. It is another object of the invention to provide in a suction cleaner a plurality of suction-creating fans combined with means to disconnect certain of said fans when dusting tools are connected to the cleaner. A still further object is the provision in a cleaner of suction-creating means and a driven surface-contacting agitator in combination with means to disconnect the agitator from the motor during the period of dusting tool use. Still another object is the provision of a suction cleaner provided with automatic means to disconnect a suction-creating fan and a motor-driven agitator from the motor by the connection of the dusting tool unit. A further object is the provision of a suction cleaner in which the attachment of the dusting tool unit automatically disconnects the agitator from the driving motor and changes the motor circuit to insure greater suction in the dusting tools. These and other more specific objects will appear upon reading the following specification and claims, and upon considering in connection therewith the attached drawings to which they relate.

Referring now to the drawings in which preferred embodiments of the present invention are disclosed:

Figure 1 is a side elevation of a modern suction cleaner embodying the invention;

Figure 2 is a bottom view of the cleaner shown in Figure 1 with certain parts broken away and shown in section;

Figure 3 is an enlarged horizontal section through the cleaner motor and the suction-creating fans similar to the section shown in Figure 2;

Figure 4 is a partial section upon a horizontal plane through a cleaner motor showing a second embodiment of the invention;

Figure 5 is a section similar to Figure 4 through a third embodiment of the invention in which only one fan is provided and the agitator alone is disconnected from the driving motor when the dusting tools are attached;

Figure 6 is a side view of a modern suction cleaner embodying a fourth embodiment of the invention and one in which means are provided to insure a higher-than-high motor speed when the dusting tools are connected;

Figure 7 is a section upon the line 7—7 of Figure 6;

Figure 8 is a schematic showing of the electrical circuit of the motor of the last embodiment showing the arrangement by which the motor is caused to rotate at a higher-than-high speed when the dusting tools are connected.

In a modern type of suction cleaner suction-creating means, comprising a plurality of motor-driven fans, draw cleaning air through the nozzle and the fan chamber and exhaust it by way of the exhaust outlet into the dust bag. An agitator is positioned within the cleaner nozzle, being driven by the motor, and cooperates with the air stream in cleaning the surface covering. The range of usefulness of this modern cleaner is enlarged through so constructing the machine that it is adapted to work in combination with a dusting tool unit. These dusting tools are well known and will not here be described, it being sufficient to say that when the dusting tools are used the machine is altered from an on-the-floor cleaner to an off-the-floor cleaner, one adapted to clean curtains, hangings etc.

When the machine is used in combination with dusting tools the cleaner proper usually remains for appreciable periods of time in one position upon the floor. During this period it is not necessary that agitator be driven. Also, there is no desirable function served by driving the suction-creating fan or fans which are not connected to the dusting tool unit. In fact, to drive the agitator and an unused fan places a load upon the motor which accomplishes no useful function. Additionally, when the cleaner is used with dusting tools it is desirable that a higher suction be provided than is requisite when the machine is used in on-the-floor cleaning with the agitator. In a suction cleaner constructed in accordance with the present embodiment means are provided which cause the cleaner motor to rotate at its highest speed when the dusting tools are connected.

Referring now to Figures 1 to 3 inclusive, in particular, a suction cleaner constructed in accordance with the present invention is disclosed. The cleaner comprises a nozzle 1, which is provided with surface-contacting lips 2 and 3, and

which is interiorly connected by passageways 4 and 5 at its ends to the inlets of two spaced fan chambers 6 and 7. Between these two fan chambers, with its axis extended parallel to the longitudinal dimension of the nozzle 1, is a driving motor 8. The stationary field 9 of the motor is fixedly carried by the casing the ends of which form the inner side walls of the fan chambers 6 and 7. The rotating armature 10 is mounted upon an elongated centrally bored shaft 11 which extends entirely through the motor casing and into the two fan chambers. The shaft is rotatably supported by bearings 12, 12 in the end walls which are provided with suitable seals to prevent air leakage from the fan chamber into the motor, or vice versa.

Within the chamber 6 is positioned a suction-creating fan 13 fixedly carried by the rotatable motor shaft 11. Fan 13 functions, in the operation of the machine, to draw cleaning air from the nozzle 1 and to force it through the exhaust outlet 14 into the dust bag 15.

Within the fan chamber 7 is positioned a second suction-creating fan 16 which is connected to the motor shaft 11 in a novel manner and which functions, in the operation of the machine in on-the-floor cleaning, to draw air from the nozzle and exhaust it via the exhaust outlet 17 into the dust bag 15. The outlets 14 and 17 may be provided with separate dust bags or they may open into the same bag 15, as shown in the drawings. In the latter event a dividing wall 18 is preferably provided to form two bag portions.

Within the nozzle 1 and extending longitudinally therein is the rotary agitator 19 of a modern and well known type which includes beating and brushing elements. Agitator 19 is provided with a pulley surface 20 opposite the air passageway 5 and receives a power-transmitting belt 21 extended through that passageway from the driving pulley 22 which is rotatable with the fan 16. As in the usual suction cleaner spaced pairs of front and rear supporting wheels 23, 23 and 24, 24 are provided which movably support the cleaner upon the surface covering undergoing cleaning with the nozzle lips 2 and 3 above the normal plane of the covering. Suitable height-adjusting means 25 are provided for the front wheels 23, 23 for the purpose of adjusting the nozzle height. The cleaner also includes the pivoted handle 26 through which the operator can exert the propelling force necessary in the operation of the cleaner in on-the-floor cleaning.

To provide for the use of dusting tools the air passageway 4 is provided with an opening 26 immediately opposite the inlet of the fan chamber 6, which opening is normally covered by a removable cover plate 27 when the machine is used in on-the-floor cleaning. Manually operable screws 40, 40 secure the plate in place, as shown in Figures 1 and 2 of the drawings. In Figure 3 the plate 27 has been removed and the cleaner end of the dusting tool unit, indicated generally by the reference character 28, has been seated on the passageway 4 and extended through the opening 26 into sealing relationship with the eye of the fan chamber 6. When so connected the dusting tool closes the fan chamber 6 to the nozzle and makes the suction thereof effective to the outer end of the flexible hose 29.

With the dusting tool connected no useful function is accomplished by driving the fan 16 and the pulley 22. To disconnect these parts, therefore, an inner shaft or plunger 30 is provided which extends the entire length of the shaft 11. The suction-creating fan 16 together with the pulley 22 are rotatably mounted on this shaft 30 within the fan chamber 7 and the passageway 5, respectively, being supported thereon by a roller bearing 31. The inner shaft is slidable within the outer shaft, but is adapted to rotate therewith. A friction clutch 32 is provided which functions to secure fan 16 and pulley 22 to the shaft 11, part of the clutch being carried by the back of the fan and the opposing part by the shaft 11.

Clutch 32 is normally held closed by a coil spring 33 which is positioned between the adjacent ends of the two shafts. This spring exerts a force upon outer end of shaft 11 and against an abutment member 34 carried by the reduced outer end of slidable inner shaft 30. The spring force urges abutment 34 from the end of shaft 11 thereby pulling the shaft 30 through the shaft 11 and the clutch surface upon the fan 16 into engagement with the frictional surface on the opposed member of the clutch carried by the shaft. Protection for the spring 33 is provided by an enclosing cup 35 which is carried by the abutment member 34. A contact element 36 adapted to receive a force to compress spring 33 and so disengage clutch 32 is positioned at the outer end of the shaft 30 being rotatable relative thereto, and also relative to the shaft 11, through being carried by an outer plate 38 of the abutment 34. Plate 38 is rotatable about a horizontal axis being spaced from the inner part of the abutment by balls 37. Contact 36 is cup-shaped and encloses the abutment and the spring-protecting cup 35, being suitably sealed to the latter at its inner end to prevent the entrance of foreign matter to the balls 37.

The dusting tool unit 28 is formed with a stationary contact member 39 arranged so as to abut contact element 36 upon the insertion of the unit into the machine. Element 30 being rotatable relative to shafts 11 and 30, remains stationary when so contacted. With the unit locked in place by the screws 40, 40 the element 36 has been urged inwardly by the stationary contact 39 against the force of spring 33; the inner shaft 30 has been moved longitudinally within the outer shaft 11 and the fan 16 and the pulley 22 declutched. Upon the removal of the dusting tool unit the pressure exerted by member 39 upon the contact element 36 disappears and the force exerted by spring 33 again moves the inner shaft to close the clutch 32. It is noted that no movement takes place between the contact elements 36 and 39 as the element 36 is rotatable relative to both the shaft 11 and the shaft 30.

From the foregoing it is believed that the operation of this embodiment of the invention is clear. It is believed to be clear that in on-the-floor cleaning both fans 13 and 16 function to create a reduced pressure within the nozzle 1, and that the rotary agitator 19 in that nozzle is driven by the pulley 22 which rotates with the motor. Upon the connection of the dusting tool unit 28 the driving pulley 22 and the fan 16 are declutched at the clutch 32 upon the longitudinal movement of the shaft 30 which is moved against the force exerted by the spring 33.

Referring now to Figure 4 in particular, a second embodiment of the invention is disclosed in which the fan chamber 7 is provided with a suction-creating fan 45 which is fixedly connected to the shaft 11. The driving pulley 22 is again rotatable relative to the slidable shaft 30, however, by means of the bearing 31 compris-

ing roller elements. The clutch in the present instance is indicated by the reference character 46 and is formed upon the outer face of the fan 45 and in an extension of the pulley 22. The declutching operation is accomplished in a manner similar to that described in connection with the first embodiment. In the operation of the cleaner with the dusting tools the pulley 22 alone remains stationary, being held by the belt 21, and rotates relative to the remainder of the moving parts through being carried by its bearing 31.

Referring now to Figure 5 in particular, a third embodiment of the invention is disclosed in which the fan chamber 7 of the previous embodiments, together with the suction-creating fan positioned therein, has been eliminated and the air passageway 5 has been transformed into a channel the sole function of which is to house the power-transmitting belt 21. In this embodiment the driving pulley 22 is rotatably mounted upon the slidable shaft 30 by means of the bearing 31 but is adapted to be clutched and rotated with the shaft 11 and the shaft 30 by means of a friction clutch 47, one part of which is carried by a sloping inner face of the extended pulley while the opposing part is carried by a member 48 formed upon the extended end of the shaft 11. Upon the attachment of the dusting tools in the present embodiment the driving pulley for the power-transmitting belt is declutched alone, there being no second fan either to rotate with the motor or to remain stationary with the clutch.

Referring now to Figures 6 to 8 inclusive a still further embodiment of the invention is shown. The relationship of the parts and the functional operation of the cleaner upon the attachment of dusting tools is the same as in the first described embodiment with the exception that means are also provided which alter the electrical circuit of the cleaner motor automatically upon the attachment of the dusting tool unit. To accomplish this result a contact housing 50 is positioned immediately adjacent the opening 26 of the passageway 4 and within this housing is mounted a spring-pressed contact member 51 which functions in its normal position to close two normally open electrical contacts A, A. Upon the attachment of the converter unit 28, however, the contact plunger 51 is depressed, against the force of its own spring, by means of a shoulder member or arm 52 carried by the unit, and the contacts A, A are permitted to open and a second pair of contacts B, B are closed. The functional results of this change in closed contacts is hereinafter set forth.

Referring now to Figure 8 in particular it is seen that incoming power leads to the motor, comprising the leads 54 and 55, enter the cleaner by way of the cleaner handle where the lead 54 extends to the handle switch 56. At the switch 56 the lead is divided into a lead 54*a* and a lead 54*b*, the former extending to the contacts A, A and from there to the outside or low speed connection of one of the motor field windings 9. The lead 54*b* extends directly from the switch 56 to a central tap of the field winding 9, known as the high speed connection of the motor. The second incoming lead 55 extends directly to the motor and connects to one side of a second field winding 9. A continuation of this lead, indicated by the reference character 55*a*, extends from the field tap through the contacts B, B to a resistance R which is connected by a lead 60 around the field winding portion 9. With the resistance R in the motor circuit, where it will be placed and in parallel with the second field portion 9 upon the closing of the contacts B, B, the motor speed will be increased.

In the operation of this last embodiment of the invention in on-the-floor cleaning the contacts A, A are forced together by the plunger member 51 in its normal position and the motor rotates at either low speed or high speed depending upon whether the switch 56 places the lead 54*a* or the lead 54*b* in the motor circuit. Upon the attachment of the dusting tool unit, however, contacts A, A are permitted to open, the contacts B, B are closed, and the resistance R is placed parallel with a part of the motor field. Upon the opening of the contacts A, A the lead 54*a* is disconnected from the motor circuit and the only position of switch 56 which will cause the motor to rotate is that position in which the lead 54*b* is connected, that is, the high speed connection. The speed of the motor in this relationship will be higher than the usual high speed due to the fact that the resistance R is in the circuit and reduces the field strength.

We claim:

1. In a suction cleaner a body including a nozzle and means to seat a dusting tool unit, suction-creating means including a plurality of fans connected to said nozzle, means to drive said fans, certain of said fans being disengageable from said driving means, and means responsive to the connection of a dusting tool unit to said body to disconnect certain of said fans from said driving means.

2. In a suction cleaner, suction-creating means adapted to be connected to a dusting tool unit, a driving motor including a plurality of circuits for various speeds connected to said suction-creating means, an agitator, power-transmission means between said motor and said agitator, means to declutch said agitator from said motor, and means responsive to the connection of a dusting tool unit to close certain of said motor circuits.

3. The construction recited by the preceding claim characterized in that the circuit closed upon the connection of said dusting tool unit is the high speed circuit.

4. In a suction cleaner of the type adapted to receive a dusting tool unit, a nozzle, a driving motor, suction-creating means including a plurality of fans connected to said nozzle, one of said fans being fixedly connected to said motor and a second fan connected through a clutch to said motor, said first fan being adapted to be connected to a dusting tool unit, and means to declutch automatically said second fan responsive to such connection.

5. In a suction cleaner, a driving motor, a nozzle, suction-creating means connected to said nozzle and including a plurality of fans, one of said fans being fixedly connected to said motor and adapted to be connected to a dusting tool unit, a second fan connected to said motor, a driving pulley, clutch means between said fan and pulley and said motor, a surface covering agitator, power-transmission means between said pulley and said agitator, and means responsive to the connection of a dusting tool unit to declutch said second mentioned fan and said pulley from said motor.

6. In a suction cleaner having a nozzle, a driving motor, a fan connected at each end of the motor to a rotating part thereof, fan chambers including inlets and enclosing said fans, and air-conducting means connecting said nozzle to said

inlets; a clutch connecting one of said fans to a rotating part of said motor, and means to declutch one of said fans responsive to the connection of a dusting tool unit to the inlet of the fan chamber housing the other fan.

7. The construction recited by claim 6 characterized in that said last mentioned means includes a slidable shaft extended longitudinally through said motor and connected to said clutch and which is moved relative to said motor by the attachment of said unit.

8. In a suction cleaner adapted to be converted into an off-the-floor unit, a nozzle, a driving motor, a fan at one end of said motor connected to a rotating part thereof, a second fan at the opposite end of said motor, a pulley adjacent said second fan, means including a clutch connecting said second fan and said pulley to a rotating part of said motor, fan chambers having inlets enclosing said fans and open to said nozzle, an agitator with its shaft extended parallel to the motor axis of rotation, power-transmitting means connecting said agitator to said pulley, and means responsive to the connection of a dusting tool unit to declutch said second fan and said pulley from the motor upon the conversion of said cleaner into an off-the-floor unit.

9. The construction recited by the preceding claim characterized in that said last mentioned means includes a slidable shaft extended longitudinally through said motor and connected to said clutch and which is moved relative to said motor upon said conversion.

10. In a suction cleaner, a body including a nozzle, a driving motor, suction-creating means open to said nozzle including a fan connected to said motor and a second fan, means including a clutch connecting said second fan to said motor, said motor including a plurality of circuits for various speeds, and means to declutch said second fan automatically and to close the high speed motor circuit responsive to the attachment of a dusting tool unit to said body and to said first fan.

11. In a suction cleaner, a nozzle, spaced fan chambers, passageways connecting said nozzle to said chambers, fans in said chambers, a driving motor between said chambers and connected to said fans, clutch means between one of said fans and said motor, the second fan being fixedly connected to said motor, the passageway leading to the chamber containing the fixedly connected fan having a dusting tool opening therein opposite said chamber, and means operated by the connection of a dusting tool unit to the chamber containing said fixedly connected fan to open said clutch to render the fan connected thereto inoperative.

12. The construction recited in the preceding claim characterized in that a spring-pressed plunger extends longitudinally through said motor from said clutch to said dusting tool unit which is moved longitudinally by said unit in its movement to its seat.

13. In a suction cleaner adapted for on-the-floor cleaning and for off-the-floor cleaning, suction-creating means including a plurality of fans, a driving motor for said fans, means connecting said fans to said motor, an on-the-floor cleaning nozzle connected to said suction-creating means, means to convert said cleaner from an on-the-floor cleaner to an off-the-floor cleaner, and means responsive to said conversion to disconnect certain of said fans from said motor.

14. In a suction cleaner, spaced fan chambers, air conducting passageways leading to said chambers and connecting said chambers to a floor nozzle in normal cleaner operation, fans in said chambers, a driving motor between said chambers, a rotatable element of said motor connected to said fans, a clutch between one of said fans and said element, an axially slidable plunger extended through said motor in the axis of rotation and adapted to disengage said clutch in one position, the passageway upon the opposite side of the motor from said declutchable fan being formed with a dusting tool opening, and a dusting tool unit adapted to be inserted through said opening to seal with the adjacent fan chamber, said unit being provided with means to contact said plunger to move it to its declutching position.

15. The construction recited in the preceding claim characterized in that said cleaner includes an agitator which is connected by a belt to a driving pulley connected to and declutchable with said declutchable fan.

16. The construction recited in the second preceding claim characterized in that spring means normally hold said clutch closed and resiliently oppose the declutching action.

17. The construction recited in the third preceding claim characterized in that said plunger is provided at its end with a contact member which is connected to it thru a bearing and is adapted to remain stationary when contacted by the dusting tool unit.

18. The construction recited by the fourth preceding claim characterized in that said declutchable fan is rotatably mounted on said plunger and that said plunger rotates relative thereto when declutched.

19. In a suction cleaner of the type in which the suction-creating means include a plurality of fans, a motor including a plurality of circuits for various speeds connected to said fans, a surface covering agitator connected to said motor, clutch means between one of said fans and agitator and said motor, and means responsive to the connection of a dusting tool unit to a part of said suction-creating means to close certain of said motor circuits and to open said clutch.

20. In a suction cleaner adapted for on-the-floor cleaning and for off-the-floor cleaning, suction-creating means including a plurality of fans, a driving motor for said fans, means connecting said fans to said motor, an on-the-floor cleaning nozzle connected to said suction-creating means, surface-agitating means positioned in said nozzle, means connecting said agitating means to said driving motor, means to convert said cleaner from an on-the-floor cleaner to an off-the-floor cleaner, and means responsive to said conversion to disconnect certain of said fans and said agitating means from said motor.

21. In a suction cleaner, a motor including a rotor, bearings rotatably supporting the ends of said rotor, a fan connected to said rotor at each of its ends outside said bearings, a clutch interposed between one of said fans and said rotor, and means extended centrally through said rotor and operable from the opposite side thereof to open and close said clutch.

22. In a suction cleaner adapted for on-the-floor cleaning and for off-the-floor cleaning, suction-creating means, a driving motor including a plurality of circuits for various speeds connected to said suction-creating means, an agitator, power-transmission means between said motor and said agitator, means to declutch said agitator from said motor, an on-the-floor clean-

ing nozzle connected to said suction-creating means, means to convert said cleaner from an on-the-floor cleaner to an off-the-floor cleaner, and means responsive to said conversion to close certain of said motor circuits.

23. In a suction cleaner, a cleaning nozzle, a plurality of fan chambers connected to said nozzle, fans in said fan chambers, driving means for said fans, means to seal one of said chambers from said nozzle, and means operative upon the sealing of said chamber from said nozzle to disconnect a fan in a second chamber from said driving means.

24. In a suction cleaner, a cleaning nozzle, an agitator in said nozzle, a plurality of fan chambers individually connected to said nozzle, fans in said chambers, driving means for said fans and agitator, means to seal one of said chambers from said nozzle, and means operative upon the sealing of said one chamber from said nozzle to disconnect said agitator from said driving means.

25. In a suction cleaner, a cleaning nozzle, an agitator in said nozzle, a plurality of fan chambers connected to said nozzle, fans in said chambers, driving means for said fans and agitator, means to seal one of said chambers from said nozzle, and means operative upon the sealing of said chamber from said nozzle to disconnect said agitator and a fan in a second chamber from said driving means.

26. In a suction cleaner, a body, a dusting tool seat on said body, a driving motor, suction-creating means in said body driven by said motor and to which a dusting tool unit connects, a surface covering agitator, power-transmitting means between said motor and said agitator, a clutch, and means actuated by the seating of a dusting tool on said body to operate said clutch to declutch said agitator from said motor.

27. In a suction cleaner, a body, a driving motor, suction-creating means in said body driven by said motor, a dusting tool seat on said body in which a dusting tool unit is adapted to seat to be connected to said suction-creating means, a surface covering agitator, power-transmitting means between said motor and said agitator, and means operative upon the physical movement of a dusting tool unit to connect it to said suction-creating means to disconnect said agitator from said motor.

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