

July 10, 1934.

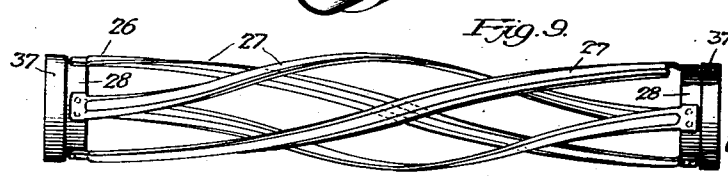
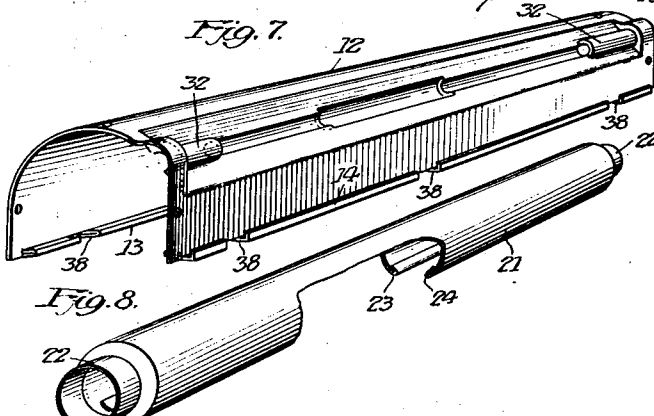
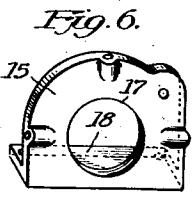
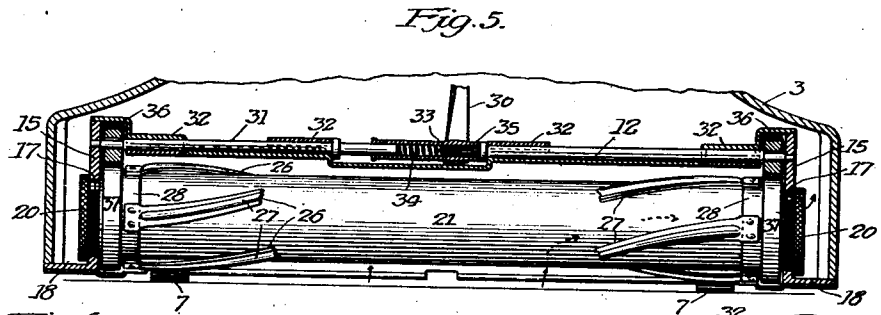
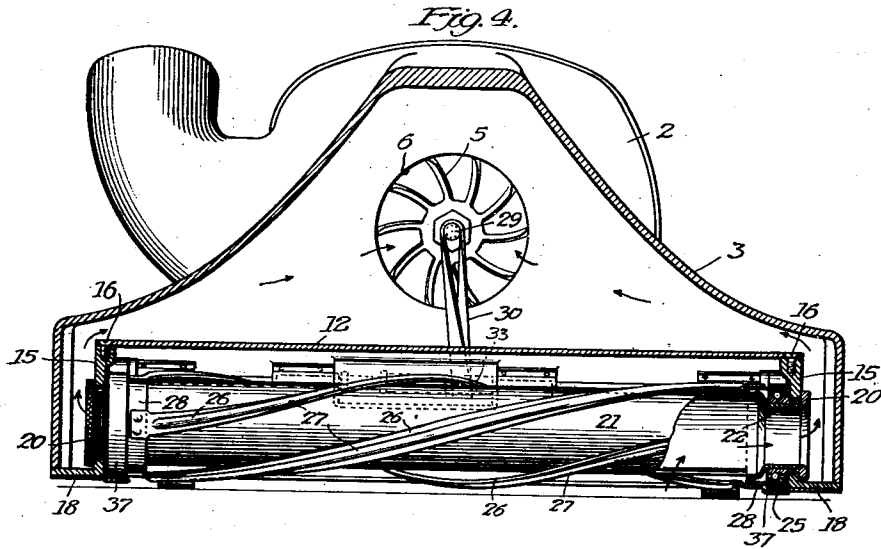
W. D. SELLERS

1,965,615

SUCTION CLEANER

Filed July 13, 1931

3 Sheets-Sheet 2



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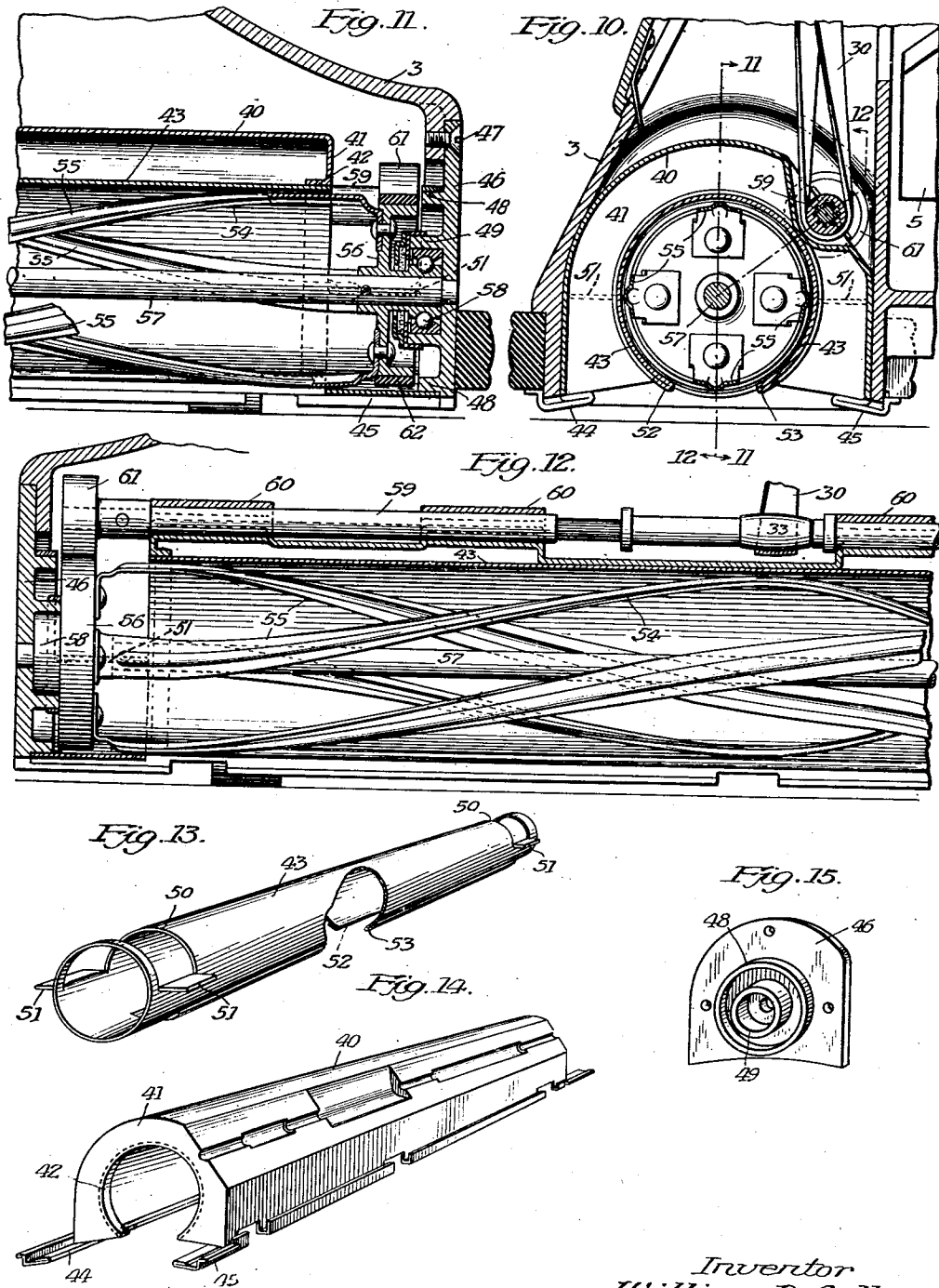
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UNITED STATES PATENT OFFICE

1,965,615

SUCTION CLEANER

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11 Claims. (Cl. 15—13)

The present invention relates to suction cleaners in general and particularly a new and improved combination of air cleaning and positively agitating means. More specifically the invention comprises the provision, in a suction cleaner, of means for accomplishing the agitation of the surface covering at exactly the point of maximum air flow.

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 new and improved construction in which the point of maximum air flow and the point of positive agitation are coincident. A still further object is the provision, in a suction cleaner, of an agitator which rotates about a nozzle. A still further object is the provision of a plurality of nozzles, one of which is positioned within the other, and about one of which rotates the surface covering agitator. A still further object is the provision, in a suction cleaner, of a plurality of nozzles one of which is positioned within a second nozzle, there being positive agitating means positioned within one of said nozzles. These and other more specific objects will appear upon reading the following specification and claims and upon referring to the annexed drawings to which they relate.

In the drawings in which preferred embodiments of the present invention are disclosed:

Fig. 1 discloses a side view of a modern suction cleaner embodying the present invention with certain parts of the outer casing broken away, the interior being shown in section upon the line 1—1 of Fig. 2;

Fig. 2 is a bottom view of the machine shown in Fig. 1;

Fig. 3 is an enlarged view of the section through the cleaner nozzle shown in Fig. 1;

Fig. 4 is a section upon the line 4—4 of Fig. 1;

Fig. 5 is a partial section upon the line 5—5 of Fig. 1;

Fig. 6 is a removable end member provided in the present invention;

Fig. 7 is a view in perspective of the removable nozzle housing shown positioned within the nozzle casing in Figs. 1 to 5 inclusive;

Fig. 8 is a view in perspective, with certain parts broken away, of the inner or secondary nozzle embodied in the present invention;

Fig. 9 is a side view of a rotatable agitator embodied in the modification shown in Figs. 1 to 5 inclusive;

Fig. 10 is an end view in cross section through a nozzle of a suction cleaner similar to that shown

in Fig. 1 but which embodies a different embodiment of the present invention;

Fig. 11 is a partial cross section upon the line 11—11 of Fig. 10;

Fig. 12 is a section through the cleaner nozzle shown in Fig. 10 looking in the direction of the arrows upon the line 12—12;

Fig. 13 is a view in perspective of the secondary nozzle embodied in this modification of the invention;

Fig. 14 is a view showing the modified nozzle housing which is removably positioned in the nozzle casing of this embodiment of the invention;

Fig. 15 is a view of the removable nozzle casing end wall of the present embodiment.

Referring again to the drawings in the various views of which the same reference character refers to the same parts, in Figure 1 a modern suction cleaner is disclosed, the outer casing of which comprises a motor casing 1, a fan casing 2, and a nozzle casing 3. An unshown motor is positioned within the motor casing 1, the shaft 4 of which extends therefrom into the fan chamber 2 where the suction-creating fan 5 is mounted thereon which is adapted, in the operation of the cleaner, to create a reduced pressure which is effective through the eye 6 of the fan chamber, in the interior of the nozzle casing 3, the upper part of which forms an air passageway leading to the eye 6. The cleaner is movably mounted by means of front wheels 7, 7 and the rear wheel 8 so that the operator may, through the use of the handle 9, propel the cleaner upon the surface covering. The front wheels 7, 7 are both mounted upon a shaft 10, being offset therefrom by means of cranks 11, 11. Means, indicated generally by the reference character 11^a, are provided by which the wheels may be positioned in various vertical positions relative to the cleaner body in order that the nozzle may be positioned for maximum efficiency relative to the surface covering undergoing cleaning.

Removably positioned within the nozzle casing is a nozzle housing member 12 which is of such width that it exactly seats within the lower end of the nozzle casing, the lower edges 13 or 14 of the housing being shaped to seat against the lower extremities of the nozzle casing 3 and to form the surface-contacting lips for the cleaner nozzle. The nozzle housing 12, in the present embodiment, is of lesser length than the surrounding nozzle casing 3 and encloses at its ends the removable end members 15, 15, being suitably mounted thereon by means of screws 16, 16 etc.

Each end member 15 of housing 12 is provided

with a centrally located relatively large diameter threaded opening 17 and with a bottom portion 18 which fits within the end of the nozzle casing 3 beyond the ends of the nozzle housing 12 and serves to entirely close the nozzle casing 3 beyond the ends of the nozzle housing 12 from the exterior atmosphere. Exterior means, such as screws 19, 19 etc., removably secure the housing end members 15, 15 within the nozzle casing and upon their removal it is possible to remove housing 12 and end members 15, 15 as a single unit.

Seated within the nozzle housing 12 and extending the entire length thereof, being seated in seat members 20, 20 threaded in the apertures 17, 17, is the hollow secondary nozzle 21, clearly shown in perspective in Figure 8. The reduced ends 22, 22 of nozzle 21 are enclosed by the seats 20, 20 it being possible to remove the secondary nozzle by unscrewing seats 20, 20 from the threaded apertures 17, 17 in the end members. Between its reduced ends the secondary nozzle is provided with a downwardly facing nozzle mouth which is defined by the edges or lips 23 and 24. As is clearly seen in Figures 1 to 5 inclusive, and particularly Figure 4, the interior of secondary nozzle 21 is open, through its reduced ends 22, 22 which extend into the apertures 17, 17 of end members 15, 15, to the interior of the nozzle casing 3 which surrounds the nozzle housing 12 and is, therefore, connected directly to the eye 6 of the fan chamber 2 and so has its pressure determined by the suction-creating fan 5.

Mounted upon the secondary nozzle 21 by means of bearings 25, 25 the inner races of which are carried by the reduced end portions 22, 22 of the nozzle, is the rotatable agitator 26 which comprises the longitudinal helically extending spaced beater members 27, 27 carried upon the end rings 28, 28. The beater elements 27, 27 lie upon an imaginary cylinder which encloses the secondary nozzle 21, being of a slightly larger radius than that member, while the rings 28, 28 enclose the outer races of the bearings, thereby permitting agitator 26 to rotate about the secondary nozzle. The rotating force for the agitator 26 is derived from the motor shaft 4 which is provided with a pulley 29 at its forward end which is connected, by means of the belt 30, to the rotatable shaft 31 mounted in suitable bearings 32, 32 etc., on housing 12. Shaft 31 is, in fact, made in two parts which are connected by means of a slidable sleeve 33 which the shaft end of the belt 30 encloses. The sleeve 33 is nonrotatably but slidably mounted upon the end of one of the parts of shaft 31 and is spring pressed, by means of the spring 34, in the direction of the other part which it encloses in a manner to prevent relative rotation therebetween through being provided with an irregular inner surface as is indicated at 35. At its ends within the housing 12 shaft 31 is provided with friction wheels 36, 36 which extend into contact with a friction surface 37 carried by each of the end rings 28, 28 of the rotatable agitator 26.

In the operation of the suction cleaner constructed in accordance with the present invention, upon the rotation of the suction-creating fan under the driving power of the cleaner motor, a reduced pressure is created in the fan chamber 2 which is immediately effective in the nozzle casing 3 which is interiorly connected thereto, through the eye of the fan chamber, as aforescribed. As the interior of secondary nozzle 21 is connected to the interior of the nozzle casing 3 at its ends 22, 22 through the ends 15, 15

of the nozzle housing 12 the reduced pressure is immediately effective therein. The interior of the nozzle housing 12, which in fact defines the extent of the main nozzle and will be hereinafter referred to as the main nozzle, is unaffected by the reduced pressure in nozzle casing 3 except in so far as the air is drawn therefrom, into the secondary nozzle 21 through the slot or mouth defined by the secondary nozzle lips 23 and 24. As the interior of nozzle casing 3, which forms an air passageway leading from the secondary nozzle 21 to the eye of the fan chamber, is entirely sealed from the exterior atmosphere by means of the nozzle housing 12 and the end member 15, 15 with the exception of its openings into the secondary nozzle 21, it is apparent that the entire draft of the suction-creating fan will be effective in drawing air into that nozzle. With the rotation of the suction-creating fan upon the motor shaft 4 the pulley 29 rotates, resulting in the movement of the belt 30 thereby transmitting the rotation of shaft 4 to the shaft 31 carried by housing 12. Upon the rotation of shaft 31 agitator 26, which is connected thereto through the contacting friction means 36 and 37, is also rotated upon its bearings 25, 25. The reduction in pressure of the secondary nozzle functions to reduce the pressure in the main nozzle 12 and the surface covering undergoing cleaning is lifted into contact with the nozzle lips 13 and 14. As the greatest flow of air is between the secondary nozzle lips 23 and 24 the surface covering will be drawn upwardly thereto but will be prevented from reaching those members by the high speed rotation of the spaced helically extending beater elements 27, 27 of agitator 26. As the lips 13 and 14 of the main nozzle are relatively wide, openings or slots 38, 38 etc. have been provided at spaced intervals therein which insure that sufficient air will be drawn between said lips and the surface covering undergoing cleaning into the main nozzle 12 to provide effective cleaning. With the agitation of the surface covering undergoing cleaning by the beating action of the elements 27, 27 adjacent the point of maximum air flow, that is under and between the lips 23 and 24, the efficient cleaning of that covering is insured.

Referring now to Figures 10 to 15 inclusive a second preferred embodiment of the invention is disclosed which differs from the embodiment shown and described in Figures 1 to 9 inclusive in that the agitator revolves within the secondary nozzle rather than therearound. In order to make possible this rearrangement certain modifications have been made necessary in the nozzle housing and in the secondary nozzle as well as in the supporting means for the agitator. In the drawings the nozzle housing, constructed in accordance with the present embodiment, is indicated by the reference character 40 and fits within the nozzle casing 3 in a manner similar to the aforescribed embodiment. Nozzle housing 40 is provided, however, with end walls 41, 41 in which are positioned large diameter openings 42, 42 which are adapted to enclose the ends of secondary nozzle 43. Nozzle housing 40 is provided with surface-contacting lips 44 and 45 which extend the entire length of the nozzle casing 3 underlying the lower edges of the walls of that casing as in the first embodiment. The secondary nozzle 43 extends beyond the main nozzle housing 40 at each of its ends and into contact with the removable end wall 46 of the nozzle casing 3, which end wall is removably held in place as by

screws 47 etc. On each removable end wall 46 are positioned concentric outstanding shoulders or flanges 48 and 49 respectively, the outer flange 48 having an outer diameter of such size that the end of secondary nozzle 43 closely fits thereover. The upper surface of secondary nozzle 43 at each of its ends between the end wall 41 of main nozzle housing 40 and 46 of nozzle casing 3, is provided with a cutaway section, indicated by the reference character 50, which provides an opening to the interior of the secondary nozzle from the interior of the nozzle casing 3. Horizontally extending shoulders 51, 51 extend from the secondary nozzle at the sides of the cutaway portions 50, 50 and, with the secondary nozzle in place in the nozzle housing 40, these shoulders 51, 51 extend into contact with the nozzle casing 3 at the ends of nozzle housing 40 functioning to close the interior of nozzle casing 3 at the end of nozzle 43. As in the previous embodiments the secondary nozzle is provided with lips which define the suction opening and which are, in the present instance, indicated by the reference characters 52 and 53.

The surface covering agitator in the present embodiment is indicated by the reference character 54 and comprises the helically extending rigid beater elements 55, 55 etc. which, in the present embodiment however, lie upon a cylinder of smaller diameter than the diameter of the secondary nozzle and are positioned in that nozzle rather than therearound as in the first embodiment. The beating elements 55, 55 etc. are carried upon end rings or plates 56, 56 which are mounted upon a shaft 57 which extends the entire length of the nozzle casing 3, said shaft being rotatably mounted in the circular shoulder or flange 49 by means of a bearing 58 at each end. The driving force for the rotary agitator in the present embodiment is received from the driving belt 30 which transmits its force to the rotatable shaft 59 carried in the bearings 60, 60 of the nozzle housing 40. Shaft 59 is in all respects a duplicate of shaft 31 in the first embodiment. At its ends shaft 59 is provided with friction wheels 61, 61 which contact the exterior of the circular ring or end plate 56 which is itself provided on its exterior with a friction surface, as indicated at 62.

In the operation of the present embodiment of applicant's invention, upon the rotation of the suction-creating fan the reduced pressure within the nozzle casing 3 is effective, through the openings 50, 50, in the interior of the secondary nozzle 43, resulting in the drawing of air between the nozzle lips 52 and 53. Air from within the nozzle housing 40 is drawn into the secondary nozzle and the surface covering undergoing cleaning is lifted into contact with the nozzle lips 44 and 45. The agitator 54 is rotated within the secondary nozzle through the power-transmitting means aforesaid which are connected to the driving belt 30 which encircles the shaft of the driving motor. As the surface covering is lifted within the nozzle and air is drawn under the lips 52 and 53 of the secondary nozzle the beating elements 55, 55 strike and agitate the surface covering undergoing cleaning between those lips resulting in the effective dislodgment of foreign matter embedded therein.

In the present modification, as in the first, the nozzle housing, the secondary nozzle, and the agitating means can be removed from the nozzle casing. To perform this operation it is necessary only to disconnect the driving belt 30 from the

slidable sleeve upon the power-transmitting shaft carried by the nozzle housing, remove the screws which connect the end members 15, 15 to the nozzle casing in the first embodiment or, in the second embodiment, the screws which secure the end members 46, 46.

I claim:—

1. In a suction cleaner, a nozzle having surface-contacting lips, a secondary nozzle into which cleaning air is drawn from the nozzle positioned within said nozzle and having a downwardly facing mouth spaced from said lips, suction-creating means connected to said secondary nozzle, a surface-contacting agitator in said first-mentioned nozzle, means to actuate said agitator, and means supporting said agitator in a position to contact a surface-covering undergoing cleaning within the projected area of the mouth of said secondary nozzle on said covering in the cleaning operation.

2. In a suction cleaner, a nozzle, a secondary nozzle into which cleaning air is drawn from the nozzle positioned within said nozzle, suction-creating means connected directly to said secondary nozzle, a rotary agitator in said nozzle, means to rotate said agitator, said agitator surrounding said secondary nozzle and being formed with openings to permit air to enter therein.

3. In a suction cleaner, a nozzle having a mouth, a secondary nozzle in said nozzle having a mouth, suction-creating means connected to said secondary nozzle to draw air into said secondary nozzle from said main nozzle, a rotary skeleton agitator including a rigid beating element mounted to rotate across the mouth of said secondary nozzle, and means to rotate said agitator.

4. In a suction cleaner, a nozzle having a mouth, a secondary nozzle in said nozzle having a mouth, suction-creating means connected to said secondary nozzle, a rotary agitator surrounding said secondary nozzle and comprising spaced helically extending beater bars, means mounting said agitator for rotation about said secondary nozzle and across the mouth thereof, and means to rotate said agitator.

5. In a suction cleaner, a nozzle having a mouth, a secondary nozzle in said nozzle having a mouth, suction-creating means connected to said secondary nozzle, a rotary agitator comprising spaced helically extending beater bars, means mounting said agitator for rotation in said secondary nozzle and across the mouth thereof, and means to rotate said agitator.

6. In a suction cleaner, a nozzle having surface-contacting lips defining a mouth, means supporting said lips above a surface covering undergoing cleaning, a hollow member positioned in said nozzle having a downwardly directed intake opening, suction-creating means connected to said hollow member, said nozzle being sealed from said suction-producing means except for said member and from the atmosphere except through its mouth, an agitator adapted to agitate the surface covering upon a portion of that covering being lifted against the surface-contacting lips of said nozzle upon air being drawn into said hollow member by said suction-creating means and means to actuate said agitator, said agitator acting upon the surface covering between the sides of the intake opening of said hollow member.

7. In a suction cleaner, a nozzle having surface-contacting lips, means supporting said lips above a surface covering undergoing cleaning, suction-

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creating means, air-conveying means connected directly to said suction-creating means and open to said nozzle through a downwardly facing opening spaced between said lips, said suction-creating means functioning to create a reduced pressure in said nozzle to lift a surface covering into contact with said lips, agitating means in said nozzle adapted to contact a surface covering between said lips and under said opening, and means to actuate said agitator.

8. A suction cleaner as set forth in the preceding claim characterized by the fact that said downwardly facing opening is an elongated slot relatively narrow as compared with the distance between said lips and is positioned slightly above the plane thereof.

9. In a suction cleaner, a nozzle having a mouth, a secondary nozzle in said nozzle having a mouth, means to support said nozzle and said secondary nozzle above the normal plane of a surface covering undergoing cleaning, means to create a reduced pressure in said nozzle and secondary nozzle connected directly to the latter alone, the reduced pressure in said nozzle being effective to lift the surface covering into contact with its mouth and closer to the mouth of said secondary nozzle, the point of maximum air flow being at the mouth of said secondary nozzle, and surface-contacting agitating means mounted to contact said covering at said point of maximum air flow, and means to actuate said agitator.

10. In a suction cleaner, suction-creating means, a nozzle connected to said means having a mouth, a downwardly facing housing connected to said suction-creating means and including a surface-contacting lip extended along said nozzle, said lip being spaced from the said mouth and above the covering undergoing cleaning, surface-agitating means positioned so as to contact a covering undergoing cleaning between the sides of said mouth, and means to actuate said agitating means, said suction-creating means functioning to reduce the pressure in said housing thru drawing air therethrough and from said nozzle to lift said covering into contact with said lip and so closer to said nozzle mouth.

11. In a suction cleaner, a nozzle having surface-contacting lips defining a mouth, means supporting said nozzle with said mouth above a surface covering undergoing cleaning, a secondary nozzle into which cleaning air is drawn from the nozzle positioned within the nozzle and having a mouth, the sides of which are spaced from the sides of the mouth of said nozzle, suction-creating means connected directly to said secondary nozzle, an agitator in said nozzle, means to actuate said agitator, said agitator being mounted within said secondary nozzle.

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