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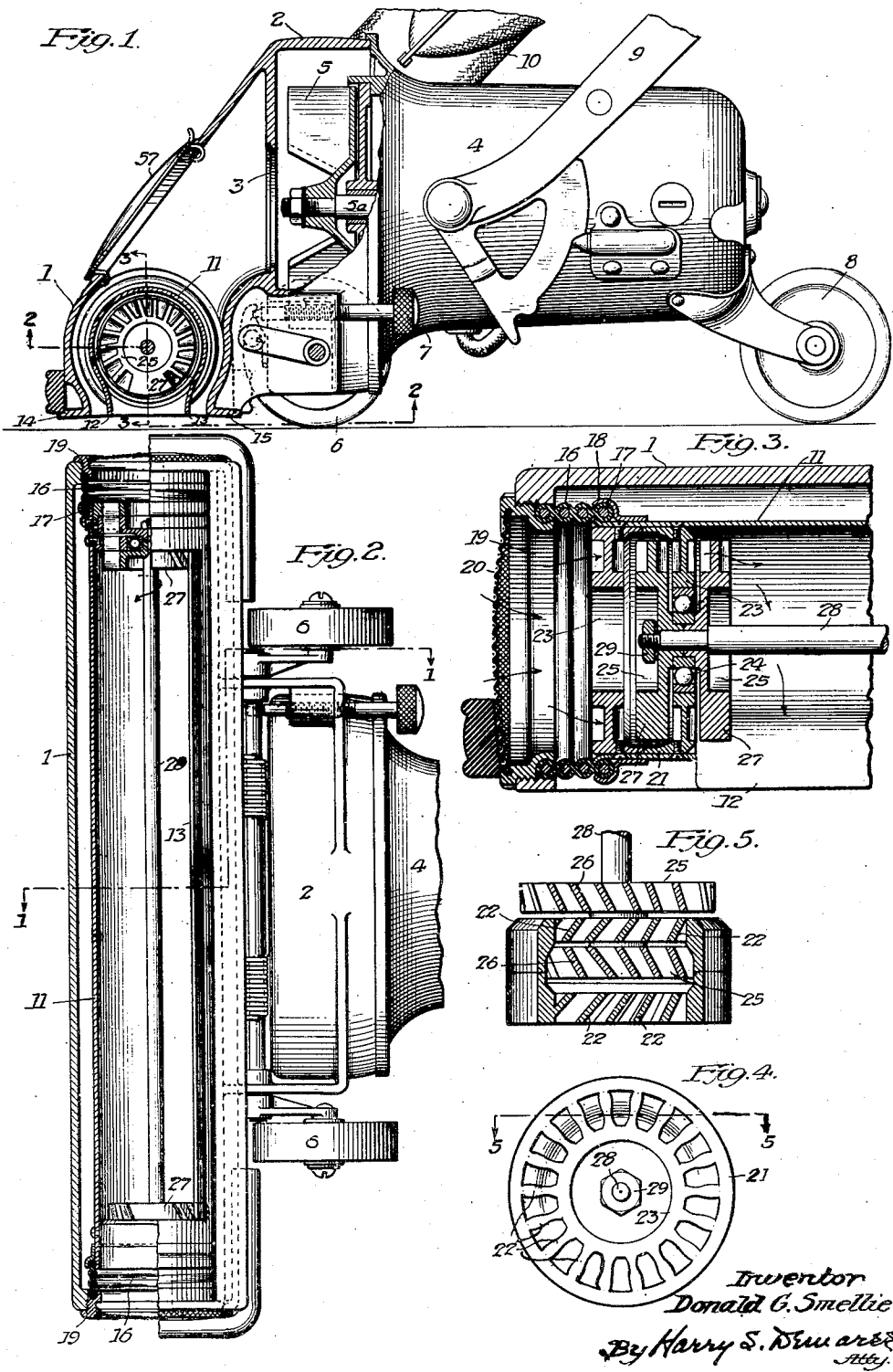
D. G. SMELLIE

2,178,003

SUCTION CLEANER

Filed April 22, 1931

3 Sheets-Sheet 1



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SUCTION CLEANER

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3 Sheets-Sheet 2

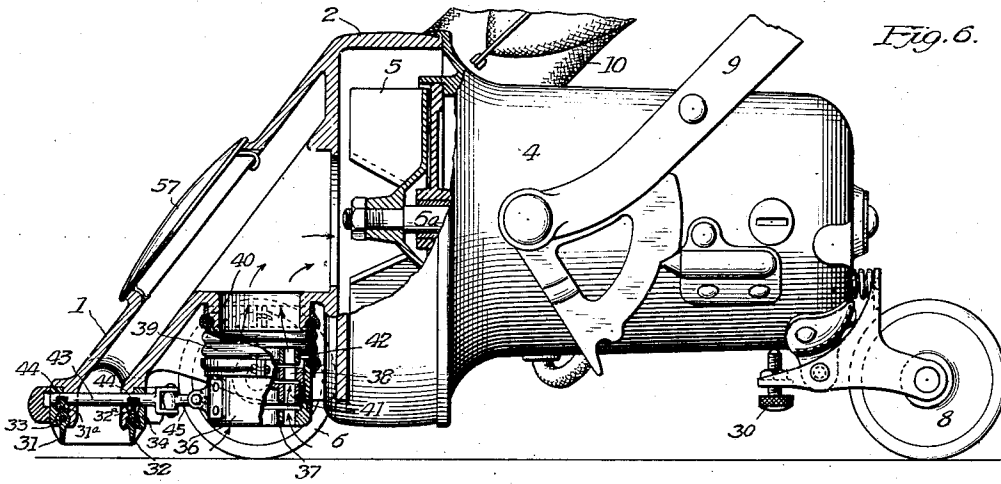
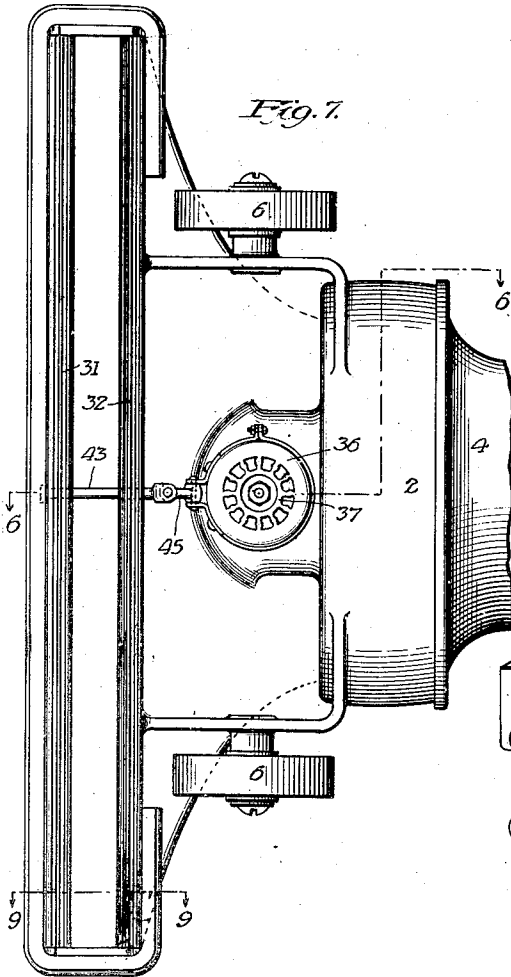
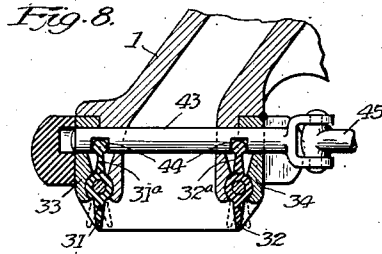
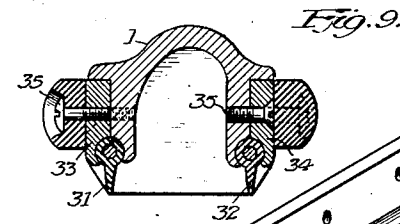
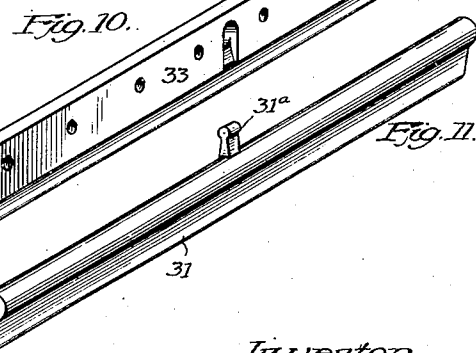


Fig. 11.

Inventor
Donald G. Smellie
By *Harry S. Dumas*
Atty.

Oct. 31, 1939.

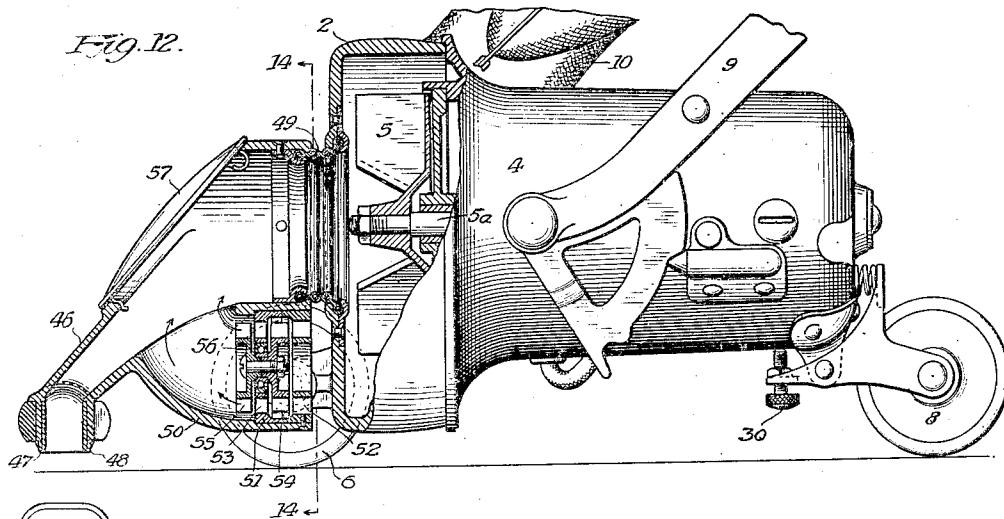
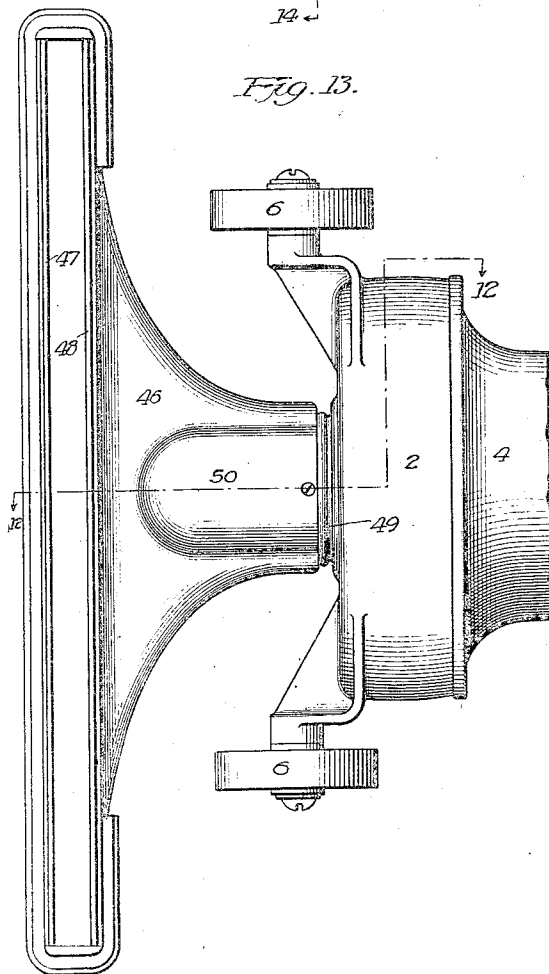
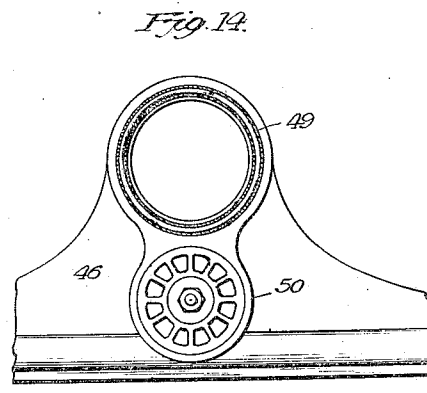
D. G. SMELLIE

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SUCTION CLEANER

Filed April 22, 1931

3 Sheets-Sheet 3



Inventor
Donald G. Smellie

By Harry S. Demaree
Atty.

UNITED STATES PATENT OFFICE

2,178,003

SUCTION CLEANER

Donald G. Smellie, Canton, Ohio, assignor to
The Hoover Company, North Canton, Ohio, a
corporation of Ohio

Application April 22, 1931, Serial No. 531,872

48 Claims. (Cl. 15—13)

The present invention relates generally to suction cleaners and particularly to new and improved agitating means which are incorporated in a suction cleaner construction to effect the agitation of the surface covering being cleaned. More specifically the invention relates to agitating means in a suction cleaner which derive their driving power from the air movement caused by suction-creating means embodied in the cleaner.

The present invention provides a suction cleaner in which no power transmission means is necessary between the cleaner motor and the surface-agitating means, thereby eliminating the pulleys and belt, or drive shaft and gears, usually found in a suction cleaner construction.

It is an object of the present invention to provide a new and improved suction cleaner. It is another object to provide new and novel agitator-actuating means in a suction cleaner. Still another object is to provide a new and improved suction cleaner of the positive agitating type in which no power transmission means are required between the driving motor and the agitating means. A still further object is to provide a novel suction cleaner construction in which the surface-covering-agitating means are actuated by means which derive their power from the air flow created by the suction-creating fan of the cleaner. Still another object is the provision of a suction cleaner in which the surface-agitating means are vibrated by means which is itself actuated by air power. These and other more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith the attached drawings in which preferred embodiments of the present invention are disclosed.

In the drawings, in which the same reference characters refer to the same parts throughout:

Fig. 1 is a side view of a suction cleaner, with certain parts broken away upon the line 1—1 of Fig. 2, with one preferred embodiment of the present invention disclosed therein;

Fig. 2 is a section upon the line 2—2 of Fig. 1;
Fig. 3 is a partial section upon the line 3—3 of Fig. 1;

Fig. 4 is an end view of one of the actuating turbines;

Fig. 5 is a section upon the line 5—5 of Fig. 4;

Fig. 6 is a side view of a suction cleaner with a second modification of the present invention embodied therein, the front part of the cleaner being broken away and shown in section upon the line 6—6 of Fig. 7;

Fig. 7 is a partial bottom view of the cleaner shown in Fig. 6;

Fig. 8 is an enlarged section thru the nozzle mouth at the section shown in Fig. 6;

Fig. 9 is an enlarged section across the nozzle mouth upon the line 9—9 of Fig. 7;

Fig. 10 is a view in perspective of a removable nozzle-lip-securing element carried by the cleaner nozzle;

Fig. 11 is a view in perspective of one of the pivoted nozzle lips shown in Figures 6 to 9 inclusive;

Fig. 12 is a side view of a cleaner, with certain parts broken away upon the line 12—12 of Fig. 13, showing a still further modified embodiment of the present invention;

Fig. 13 is a partial bottom view of the cleaner shown in Fig. 12;

Fig. 14 is a section thru the cleaner shown in Fig. 12 looking in the direction of the arrows on the line 14—14.

Referring now to Figures 1 to 5 inclusive, a preferred embodiment of the present invention is disclosed in which a vibrating air tunnel, provided with surface-agitating lips, is positioned within the suction cleaner nozzle and is positively actuated by turbines, the rotors of which are unbalanced, the turbines being carried by the air tunnel within the suction cleaner nozzle. This construction is shown embodied in a suction cleaner in which the nozzle is represented by the reference character 1. The fan chamber 2 is formed integrally with the nozzle 1 and is interiorly connected thereto thru the eye or inlet 3. A motor casing 4 is positioned at the rear of the fan chamber and houses a suitable driving motor, which is not shown, for the suction-creating fan 5 which is mounted within the fan chamber upon the extended motor shaft 5a. Front supporting wheels 6, 6 are pivotally mounted to the forward end of the cleaner adjacent the fan chamber 2 and are provided with height-adjusting means, indicated by the reference character 7. The rear of the suction cleaner is supported by means of a wheel 8 and a pivoted handle 9 is provided by means of which the operator may propel the suction cleaner over the surface covering undergoing cleaning. As in the usual suction cleaner construction a suitable dust bag 10 is provided which is interiorly connected to the fan chamber 2 to receive the dirt-laden air which is exhausted therefrom under the action of the rotating fan 5.

Positioned within the suction cleaner nozzle 1 and extending thereacross is a tunnel member

11, commonly known as an air tunnel or housing. The lower edges or lips of the tunnel, indicated by the reference characters 12 and 13, extend substantially into the plane of the nozzle lips 14 and 15, or at least sufficiently far into the nozzle mouth that they are adapted to contact the surface covering in the operation of the cleaner. The tunnel is movably supported from the end walls of the nozzle by means of the relatively flexible and resilient supports indicated by the reference characters 16, 16. These supports preferably comprise molded rubber tubes in which are embedded coiled wire springs, indicated by the reference character 17. Each support 16 is secured to the end of the air tunnel thru being clamped thereto by an enclosing seat member 18. Adjacent the nozzle wall the support is removably secured by means of a ring 19 which is screw threaded into the nozzle end wall and functions to clasp or clamp the end of the support thereto. The opening in the nozzle end wall in which the ring 19 is screw threaded is of relatively large diameter being substantially equal in cross section to the air tunnel. Thru this opening air is permitted to enter the air tunnel 11, first passing thru a strainer member 20 carried by the removable ring 19 which prevents the entrance of foreign matter with the air.

Positioned within each end of the air tunnel 11 is an unbalanced turbine comprising a stationary frame 21 which includes spaced series of radially extending guide vanes 22, 22, the inner circumference of each series of vanes being defined by a circular ring 23. A bearing 24 is mounted in the inner of the two series of guide vanes with its outer race positioned in the surrounding ring 23 of that series of vanes. Spaced rotors 25, 25 are positioned upon the opposite sides of the inner of the series of guide vanes and are rotatably carried by the inner race of the bearing 24. The rotors comprise vanes 26, 26 which, it is to be noted, are directed oppositely to the vanes 22, 22, and each rotor is provided with a section 27, 27 in which no vanes are provided thereby creating an unbalanced condition. A spindle or shaft 28 extends the length of the air tunnel 11 and upon this spindle the rotors 25, 25 at each end of the tunnel are secured, being clamped on the reduced ends thereof by means of a nut 29. It is to be noted that the unbalanced masses 27, 27 on each rotor are positioned at the same circumferential position relative to the shaft 28, thereby insuring that the vibrating or shaking effect of the unbalanced rotors will be cumulative.

In the operation of the improved suction cleaner, constructed in accordance with the aforescribed embodiment, upon the rotation of the suction-creating fan 5 by the driving motor shaft 5a, air is drawn from the nozzle 1 creating a reduced pressure therein. The surface covering positioned below the nozzle lips 14 and 15 is lifted thereagainst and, as those lips are relatively broad, the flow of air thereunder and therebetween is substantially decreased and air is drawn into the nozzle by way of the end openings in the nozzle end walls. The air is drawn thru the rings 19, 19 defining the openings and passes thru the tubular supporting members 16, 16 and into the turbines which are carried at ends of the tunnel. Upon passing thru the outer series of guide vanes carried by the stationary frame 21 of each turbine the intruding air is directed so that it impinges upon the vanes 26, 26 of the first rotor 25 resulting in the rotation of

that member. Upon leaving the first rotor 25 the air passes thru the second series of directing vanes 22, 22 and is guided so that it may again impinge upon the vanes 26, 26 of the second rotor 25 to exert a force on that member in the direction of rotation. The air upon leaving the inner rotor 25 passes into the air tunnel proper and is drawn under the lips 12 and 13, which are then in contact with the surface covering suspended between the main nozzle lips 14 and 15, and so on into the main nozzle 1. Upon rotation of the rotors 25, 25 at each end of the tunnel 11 the unbalanced masses 27, 27 embodied therein function to cause the entire construction, which is movably supported by the flexible supports 16, 16, to be vibrated, resulting in the surface-contacting lips 12 and 13 violently agitating, flexing and beating the surface covering with which they contact. Inasmuch as these lips 12 and 13 are of relatively small thickness they are well adapted to perform this function and penetrate between the adjacent tufts of pile to dislodge the embedded foreign matter and thereby permit the air, which is being drawn between themselves and the surface covering, to remove that foreign matter.

Referring now to Figures 6 to 11 inclusive, a second preferred embodiment of the present invention is disclosed. In this embodiment the suction cleaner nozzle is again indicated by the reference character 1, the fan chamber by the reference character 2 and the motor casing by the reference character 4. The fan 5 is mounted upon extended motor shaft 5a within the fan chamber 2 and front supporting wheels 6, 6 support the front end of the cleaner but are in this embodiment, however, rigidly mounted, the variation in nozzle height being accomplished by means of the rear supporting wheel 8 which is provided with suitable height-adjusting means indicated generally by the reference character 30. The usual actuating handle 9 and dust bag 10 are also embodied. According to the present embodiment the nozzle 1 is provided with pivoted lips 31 and 32 which extend the length of the nozzle and define the sides of the mouth thereof. The lip 31 is shown in perspective in Figure 11 and is seen to include a rounded body portion which forms a suitable supporting surface about which the lip may be pivoted. The lower edges of each of the front and rear nozzle walls are provided with a curved seat portion adapted to receive one side of the rounded body of a lip and the detachable plate members 33 and 34 are secured to the front and rear nozzle walls, respectively, and cooperate with the lower extremities thereof to seat the rounded portion of the lips. Suitable means such as screws 35, 35 etc. are provided with detachably secured plates 33 and 34 to the nozzle walls. At substantially its center each lip is provided with an upstanding arm or lug, these lugs being indicated by the reference characters 31a and 32a. Adjacent the point where the lugs are formed upon the lips the walls of the nozzle, and also the adjacent plates 33 and 34, are provided with recesses in order that the lugs will not be interfered with in the tilting movement of the lips.

To actuate the lips 31 and 32 an air turbine is provided which is of the axial flow type and comprises an outer frame 36 which includes the spaced series of guide vanes 37 and 38. The frame of the turbine is movably supported from the casing of the suction cleaner by means of a resilient support 39 which is mounted at its upper

end to a depending circular flange 40 which defines the opening to the eye of the fan chamber thru which the air drawn thru the turbine is to pass. As in the first-described embodiment the rotors 41 and 42 are unbalanced and are carried by the turbine frame. A shaft 43 is mounted transversely relative to the nozzle, being slidably supported by the front and rear nozzle walls, and extending therethru at the points at which the lugs 31a and 32a on the nozzle lips are positioned. The shaft 43 is formed with pockets or seats 44, 44 into which the upper ends of the lugs 31a and 32a project. At its rear end the shaft 43 is forked and is pivotally connected to a short arm member 45 which is itself pivotally connected, about an axis of right angles to its connection with the shaft 43, to the frame 36, thereby connecting the frame 36 to the shaft 43 by a universal joint arrangement.

In the operation of this embodiment of the invention, as the air is drawn thru the nozzle mouth in response to the suction created by the revolving suction-creating fan 5 air will also be drawn thru the air turbine resulting in the rotation of the rotors 41 and 42 which will effect the vibration of the frame 36 upon its resilient mounting. The movement of frame 36 will be transmitted to the shaft 43 which will be reciprocated in its supports in the nozzle walls. The movement of the shaft 43 in the direction of the longitudinal axis of the cleaner results in the pivotal movement of the nozzle lips at a rate which is dependent upon the frequency of the vibration of the turbine itself. The surface covering which is undergoing cleaning which is drawn against the reciprocating lips 31 and 32 by the suction within the nozzle will be vibrated and agitated and the embedded foreign matter dislodged that the cleaning air may effectively remove it.

Referring now to Figures 12 to 14 inclusive, a still further preferred embodiment of the present invention is disclosed in which the rigidly attached nozzle 1 of the aforescribed embodiments has been eliminated and in its place has been provided a nozzle 46 having rigidly attached lips 47 and 48 and which is itself flexibly and resiliently supported from the eye of the fan chamber by means of a flexible support 49. On its underside between its mouth, as defined by the lips 47 and 48, and the fan chamber 2, the nozzle is provided with a depending rearward opening passageway 50. At the open end of passageway 50 is mounted an air turbine similar to those described in connection with the aforescribed embodiments and comprising an outer frame 51 which includes the spaced series of guide vanes 52 and 53 and the spaced rotors 54 and 55 which are rotatably mounted, by means of the bearing 56, on the inner of the series of guide vanes indicated by the reference character 53. As in the previous modifications, the rotors, here indicated by the reference characters 54 and 55, embody an unbalanced mass and upon being rotated by the inrushing air into the nozzle effect a vibration which results in the actuation of the entire nozzle and the consequent agitation of the surface covering by means of the lips 47 and 48 which contact thereagainst.

In each of the embodiments described, the nozzle of the cleaner has been provided with a removable cover plate, indicated by the reference character 57. If it is desired to use dusting tools with the cleaner it is only necessary to remove the plate 57 and to insert the dusting

tools into the nozzle and into intimate contact with the eye of the fan chamber. The dusting tool so inserted functions to close the interior of the fan chamber from both the nozzle mouth and from the air turbine which operates the agitating means, thereby resulting in a unit in which the entire energy of the suction-creating fan is directed toward the production of suction in the dusting tool.

I claim:

1. In a suction cleaner, a body, suction-creating means, surface-covering-agitating means, means resiliently mounting said agitating means in said body, an unbalanced air turbine, means in said body connecting said suction-creating means to said air turbine to direct air there-thru, and means operatively connecting said turbine to said agitating means to vibrate said last mentioned means in the operation of the cleaner.

2. In a suction cleaner, a surface-contacting-agitating element, suction-creating means connected to one side only of said element and adapted to draw cleaning air thereunder, an air turbine including an unbalanced rotor operatively connected to said element to actuate same, said turbine being connected between said suction-creating means and the external atmosphere so that in the operation of the cleaner air is drawn through said turbine to rotate said rotor.

3. In a suction cleaner, a nozzle, suction-creating means connected to said nozzle adapted to reduce the pressure therein, an agitating element movably carried by said nozzle and exposed to nozzle pressure on one side and a greater pressure on the opposite side so that air flows thereunder, an air turbine exposed to atmospheric pressure on one side and a lesser pressure on its opposite side so that air flows there-thru, said turbine being operatively connected to said element to actuate same in the operation of the machine.

4. In a suction cleaner, a nozzle, a hollow movable agitator positioned in said nozzle and interiorly connected to atmosphere and to the nozzle, said agitator including an agitating element adjacent the opening into the nozzle, and means to actuate said agitator comprising an unbalanced air turbine operatively connected to said agitator, and suction-creating means to draw air thru said agitator and under said agitating element and thru said turbine.

5. In a suction cleaner, a nozzle, a hollow agitator movably mounted in said nozzle and interiorly connected to atmosphere and to the nozzle, means to actuate said agitator comprising an air-driven turbine carried by said agitator and means to rotate said turbine comprising suction-producing means adapted to draw air through said agitator and turbine.

6. In a suction cleaner, a nozzle, means to create a reduced pressure in said nozzle, an agitator, means mounting said agitator for translatable motion in said nozzle, and an unbalanced air turbine positioned between atmosphere and the pressure-reducing means and operatively connected to said agitator to vibrate same.

7. In a suction cleaner, suction-creating means, a nozzle interiorly connected to said suction-creating means, non-rotating movable agitating means positioned in said nozzle, an air turbine operatively connected to said agitating means to actuate said means, means to direct an air flow thru said turbine in response to the suction created by said suction-creating means,

and means to direct the air exhausted by said turbine between said agitating means and the surface covering undergoing cleaning.

8. In a suction cleaner, suction-creating means, a nozzle interiorly connected to said suction-creating means, an agitating air tunnel in said nozzle and interiorly connected to atmosphere and the nozzle, means movably mounting said tunnel, and an unbalanced air turbine carried by said tunnel and positioned between its interior and atmosphere so that air entering said tunnel from atmosphere passes thru said turbine.

9. In a suction cleaner, suction-creating means, a nozzle having a mouth and interiorly connected to said means, an agitating air tunnel interiorly connected to atmosphere and having lips extended into the nozzle mouth positioned in said nozzle, resilient flexible means movably supporting said tunnel from the ends of said nozzle, and an unbalanced air turbine carried by said tunnel to vibrate same upon the movement of air therethru in response to the reduced pressure created in said nozzle by said suction-creating means.

10. In a suction cleaner, suction-creating means, an open ended nozzle having a mouth and interiorly connected to said means, an agitating air tunnel in said nozzle having lips extended into the nozzle mouth, resilient means supporting said air tunnel from the nozzle end walls and interiorly connecting it to atmosphere through the openings therein, and unbalanced air turbines carried by the ends of said tunnel adapted to receive the air passing into said tunnel through said resilient mounting means to vibrate said tunnel.

11. In a suction cleaner, suction-creating means, an open ended nozzle having a mouth and interiorly connected to said means, an agitating air tunnel in said nozzle having lips extended into the nozzle mouth, resilient tubular means supporting said air tunnel from the nozzle end walls and interiorly connecting it to atmosphere through the openings therein, and uniformly unbalanced interconnected air turbines positioned at the ends of said tunnel to receive the air entering said tunnel through said tubular means to vibrate said tunnel.

12. In a suction cleaner, suction-creating means, a nozzle interiorly connected to said suction-creating means, non-rotating agitating means positioned in said nozzle, air actuated vibrating means operatively connected to said agitating means, and means to direct an air flow from the exterior atmosphere thru said vibrating means and between said agitating means and the surface covering undergoing cleaning in response to a reduced pressure in said nozzle effected by said suction-creating means.

13. In combination with a suction-creating device, a nozzle operatively connected thereto and provided with a vibrating carpet-agitating element, an unbalanced rotary air motor movably mounted relative to said nozzle and connected therethrough to said suction-creating device, said motor being connected to and adapted to vibrate said agitating element.

14. In a suction cleaning device, a nozzle provided with movable non-rotatable surface-agitating means, an unbalanced air motor mounted for limited translation connected to said agitating means, suction-creating means operatively connected to said nozzle and to said unbalanced air motor for the purpose of drawing

cleaning air through said nozzle and of driving said motor to vibrate said agitating means.

15. In a suction cleaner, suction-creating means, a nozzle interiorly connected to said means, a movable lip defining a side of the mouth of said nozzle, an air turbine, means interiorly connecting said turbine to the suction-creating means, and means operatively connecting said turbine to said lip.

16. In a suction cleaner, suction-creating means, a nozzle interiorly connected to said means, a pivoted lip defining a side of the mouth of said nozzle, an inlet to said nozzle, an unbalanced air turbine, flexible means connecting said turbine to said inlet, and power-transmission means connecting said turbine to said pivoted lip whereby the lip is vibrated by reason of the vibrating movement of the turbine.

17. In a suction cleaner, suction-creating means, a nozzle interiorly connected to said means, a movable surface-contacting agitating member defining a side of the mouth of said nozzle, an air turbine, means interiorly connecting said turbine to the suction-creating means, and means operatively connecting said turbine to said agitating member.

18. In a suction cleaner, suction-creating means, a nozzle interiorly connected to said means, a movable surface-contacting agitating element at the side of the mouth of said nozzle, an unbalanced air turbine, means movably supporting said turbine, means interiorly connecting said turbine to the suction-creating means, and means connecting a vibrating part of said turbine to said element to reciprocate said element in the operation of the cleaner.

19. In a suction cleaner, suction-creating means, a nozzle interiorly connected to and movably supported by said means, nozzle lips defining the mouth of said nozzle, a second opening into said nozzle, and an unbalanced air turbine positioned in said opening and adapted to vibrate said nozzle upon air being drawn therethrough by said suction-creating means.

20. In a suction cleaner, suction-creating means, a surface-contacting cleaning nozzle having a mouth connected to said suction-creating means and movable relative thereto, and an unbalanced air turbine carried by said nozzle out of the path of foreign material entering through said mouth and connected to said suction-creating means, said turbine being effective to vibrate said nozzle upon the drawing of air therethrough by said means.

21. In a suction cleaner, suction-creating means, a surface-contacting cleaning nozzle having a mouth, means movably connecting said nozzle to said suction-creating means, an air turbine including an unbalanced rotor mounted on said nozzle member out of the path of dirt-laden air and connected to said suction-creating means, said turbine being effective to vibrate said nozzle upon the drawing of air therethrough by said suction-creating means.

22. In a suction cleaner, a surface-contacting nozzle having a surface-contacting cleaning mouth, an unbalanced air motor connected to said nozzle, and suction-creating means to draw air through said nozzle and motor, said motor being effective to vibrate said nozzle.

23. In a suction nozzle, a casing having an intake opening and an outlet opening, an agitator member movably supported with respect to said casing adjacent to said intake opening, and an unbalanced rotary member adapted to be rotated

ed by flow of air through said casing when air is drawn therethrough by suction-creating means, said rotary member being connected to impart vibratory motion to said agitator member.

24. In a suction nozzle, a casing having an intake opening and having an outlet opening, an agitator member movably supported in said casing adjacent to said intake opening, and an unbalanced rotary member rotatable by a flow of air to a source of suction connected to said casing outlet, said rotary member being mechanically connected with said agitator to impart vibratory motion thereto.

25. In a suction nozzle, a casing having an inlet opening and having an outlet opening, a non-rotatable agitator member movably supported in said casing adjacent to said intake opening, and an unbalanced rotary member mounted for transverse movement and connected to said agitator member to actuate that element, said rotary member being adapted to be rotated by flow of air to a source of suction at said casing outlet.

26. In a suction nozzle, a casing having a primary inlet opening and having an outlet opening and having a clean air inlet opening, an agitator member movably supported in said casing adjacent said primary inlet opening, and an unbalanced rotary member adapted to be rotated by flow of air through said clean air inlet with a source of suction open to said outlet, said rotary member being mechanically connected to said agitator member to impart vibratory motion thereto.

27. In a suction nozzle, a casing having an inlet opening and having an outlet opening, an agitator member movably supported in said casing in said inlet opening, and an unbalanced rotary member adapted to be rotated by air flow through said inlet opening upon the pressure at said outlet opening being reduced, said rotary member being connected to said agitator member to impart vibratory motion thereto.

28. In a suction nozzle, a casing having an inlet opening and having an outlet opening and having a clean air inlet opening, a vibrating agitator member movably supported in said casing adjacent said inlet opening, and an unbalanced rotary member mounted for translation, connected to said agitator member to actuate same, and adapted to be rotated by a flow of air through said clean air inlet opening caused by suction-creating means reducing the pressure at said outlet.

29. In a suction cleaning nozzle, a cleaning nozzle casing having an inlet opening adapted to contact a surface covering undergoing cleaning and an outlet opening, an agitator member supported adjacent said inlet opening for simultaneous contact with said surface covering and for movement up and down relative thereto, and an unbalanced rotary member connected to said agitator member and rotatable by a flow of air through said casing to a source of suction.

30. In a suction cleaning nozzle, a cleaning nozzle casing having an inlet opening adapted to contact a surface covering undergoing cleaning and an outlet opening, an agitator member supported adjacent said inlet opening simultaneous contact with said surface covering and movable vertically, and an unbalanced rotary member connected to said member and rotatable by a flow of air through said casing to a source of suction to actuate said agitator member in a path having a vertical component.

31. In a suction nozzle, a casing having a primary inlet opening and having an outlet opening rotary member mounted on said agitator member

and having a clean air inlet opening, a non-rotating agitator member movably supported in said casing adjacent said primary inlet opening, and an unbalanced axial flow turbine rotor mounted for limited free movement connected to said agitator member, and adapted to be rotated by a flow of air drawn through said clean air inlet in response to suction-creating means open to said outlet.

32. In a suction nozzle, a casing having an intake opening and an outlet opening, a non-rotating agitator member movably supported for translation in said casing adjacent to said intake opening; and an unbalanced vibratory rotary member connected to said agitator member and rotatable by air flow through said casing upon air being drawn therethrough by suction-creating means.

33. In a suction nozzle, a casing having a primary inlet opening and having an outlet opening and having a clean air inlet, a non-rotating agitator member movably supported for reciprocation in said casing adjacent said primary inlet opening and an unbalanced rotary member connected to said agitator member and rotatable by a flow of air drawn through said clean air inlet by suction-creating means open to said outlet opening.

34. In a suction cleaner, suction-creating means, a nozzle interiorly connected to said suction-creating means, non-rotating movable surface agitating means positioned in said nozzle, an air turbine operatively connected to said agitating means to actuate said means, means to direct an air flow through said turbine in response to the suction created by said suction-creating means, and means to direct the air exhausted by said turbine into contact with a surface covering undergoing cleaning to remove dislodged foreign matter.

35. In a suction cleaner, in combination, a casing having a nozzle formed with a downwardly facing mouth transversely arranged, and a fan chamber having an inlet communicating with the interior of said nozzle, a rotatable element separate from and additional to the fan shaft, means supporting said element for rotation about its axis and also for movements transversely of its axis, an eccentric mass carried by said element, means for rotating said element, a movable agitating element located in operative relation to said mouth, said agitating element being connected to said rotatable element so that forces from the transverse movements of the latter are transmitted to and actuate the former.

36. In a suction cleaner, in combination, a casing having a nozzle formed with a downwardly facing mouth transversely arranged, and a fan chamber having an inlet communicating with the interior of said nozzle, a rotatable element separate from and additional to the fan shaft, means supporting said element for rotation about its axis and also for movements transversely of its axis, an eccentric mass carried by said element, means for rotating said element, an agitating element located in operative relation to said mouth, said agitating element being connected to said rotatable element so that said transverse movements of the latter are imparted to the former.

37. In a suction nozzle, a casing having an inlet opening and having an outlet opening, an agitator member resiliently supported in said casing adjacent to said inlet opening, and an unbalanced

and adapted to be rotated by flow of air to a source of suction at said outlet opening.

38. In a suction nozzle, a casing having an inlet opening and having an outlet opening and
5 having a clean air inlet opening, an agitator member resiliently supported in said casing adjacent said inlet opening, and an unbalanced rotary member mounted on said agitator member and adapted to be rotated by a flow of air through
10 said clean air inlet opening by suction-creating means reducing the pressure at said outlet opening.

39. In a suction nozzle, a casing having an inlet opening and an outlet opening adapted to be
15 connected to a source of suction, an agitator member movably supported in said casing adjacent to said inlet opening so as to be movable only in a constrained path toward and from said inlet opening, and an unbalanced rotary member adapted to be rotated by flow of air to said source
20 of suction, said rotary member being mechanically connected to impart vibratory motion to said agitator member.

40. In a suction cleaner, suction-creating
25 means, a surface-contacting cleaning nozzle having a mouth connected to said suction-creating means, and movable relative thereto, a clean air inlet to said nozzle, an unbalanced air turbine carried by said nozzle and through which air entering
30 said nozzle through said clean air inlet passes, said turbine being effective to vibrate said nozzle in operation.

41. In a suction cleaner, suction-creating
35 means, an unbalanced air turbine connected to said means and operated thereby, means mounting said turbine for limited free movement under the forces set up within itself in operation, means to resolve the components of movement in said turbine into simple linear movement, and surface
40 agitating means actuated by said last-mentioned means.

42. In a suction cleaner, a body, an agitator, means mounting said agitator relative to and in
45 operative relationship with said body for free limited translation, and means comprising an unbalanced rotary motor directly connected to said agitator for synchronous movement therewith, the unbalanced element of said motor rotating about an axis to impart motion having a
50 vertical component to said agitator.

43. In a suction cleaner, a body, an elongated agitator, means mounting said agitator on said body for free limited translation including motion

in a horizontal direction, and means comprising an unbalanced rotary motor directly connected to said agitator for synchronous movement, the unbalanced element of said motor rotating about an axis to impart motion to said agitator having a horizontal component.

44. In a suction cleaner, suction-creating means, a nozzle connected to said means, an agitator within said nozzle, means mounting said agitator for limited free movement toward and from a surface covering positioned below said
10 nozzle, an unbalanced rotary motor in said nozzle connected to said agitator for common displacement therewith relative to said nozzle, the unbalanced element of said motor being rotatable
15 about a horizontal axis.

45. In a suction cleaner, a casing, an agitator body, means resiliently supporting said body on said casing for limited free movement, an agitating element carried by said body, and an unbalanced rotary motor mounted in said body to
20 actuate said element.

46. In a suction cleaner, suction-creating means, a non-vibrating suction cleaning nozzle connected to said means, a surface agitator movable independently of said nozzle mounted for
25 vibration in operative relationship thereto such that foreign material dislodged by said agitator from a surface covering undergoing cleaning is drawn into said nozzle by the air flow created by said suction-creating means, and means to vibrate
30 said agitator comprising a rotatable unbalanced mass, and means to rotate said mass.

47. In a suction cleaner, suction-creating means, a non-vibrating suction cleaning nozzle connected to said means, a surface agitator movable independently of said nozzle mounted for
35 vibration in operative relationship thereto in order that foreign material dislodged by said agitator from a surface covering undergoing cleaning is drawn into said nozzle by the air flow created by said suction-creating means, a rotatable unbalanced unit carried by said agitator and of such mass that upon rotation it is capable of
40 vibrating said agitator, and means to rotate said unbalanced unit at a speed to vibrate said agitator.

48. In a suction cleaner, a nozzle, a non-rotating agitator resiliently and movably mounted in said nozzle, an unbalanced mass rotatably mounted on said agitator and movable laterally therewith, and means to rotate said mass.

DONALD G. SMELLIE.