

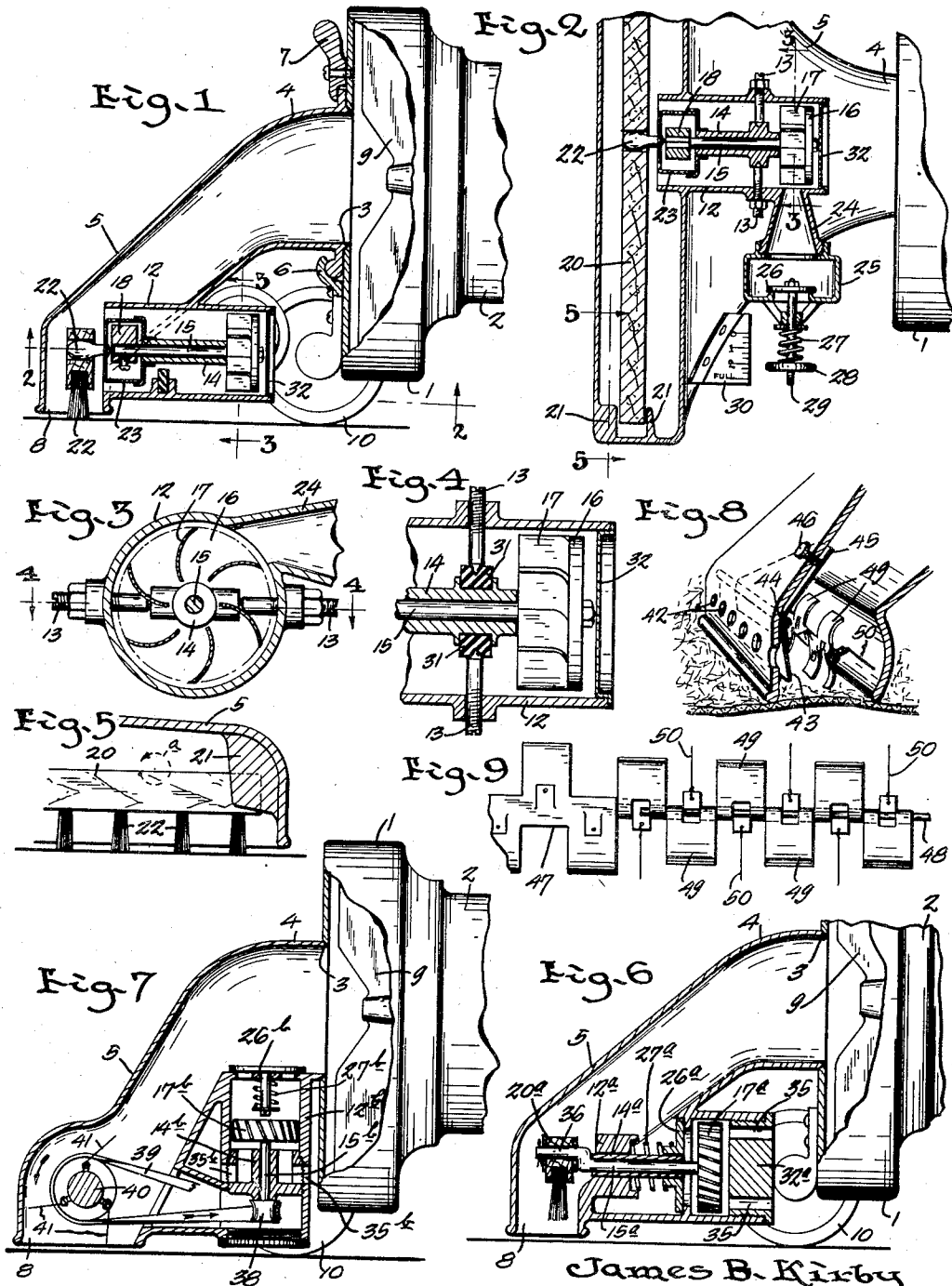
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SUCTION CLEANER

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SUCTION CLEANER

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This invention relates to portable electric suction cleaners and has for its object the provision of means for adjusting the suction in the nozzle sufficiently to perform cleaning without picking up rugs and carpets from the floor; the provision of new and improved means for operating a brush or agitating member; the provision of driving means for a brush or agitator which means shall become operative only when the cleaner is supported with its collecting mouth in operating relation to a rug or carpet; the provision of a brush-operating device which operates without connection to any other part of the machine and is hence easily usable with a removable type of nozzle; the provision of a suction cleaner brush having a new type of movement; while further objects and advantages of the invention will become apparent as the description proceeds. This application contains matter disclosed in application Serial No. 259,102, filed March 5, 1928.

In the drawing accompanying and forming a part of this application I have shown certain illustrative embodiments of my said invention. Fig. 1 is a vertical longitudinal sectional view through a portable type suction cleaner containing my improvements; Fig. 2 is a horizontal sectional view corresponding generally to the line 2-2 of Fig. 1; Fig. 3 is a detail sectional view corresponding to the line 3-3 of Figs. 1 and 2; Fig. 4 is a detail enlarged sectional view corresponding to the line 4-4 of Fig. 3; Fig. 5 is a detail view of one end of the brush corresponding to the line 5-5 of Fig. 2; Figs. 6 and 7 illustrate modified forms of my invention; Fig. 8 is a broken perspective view of still another type of suction cleaner including certain of my improvements; and Fig. 9 is a detail view of the rotary element shown in Fig. 8.

Describing the parts shown in the drawing by means of reference characters, 1 represents the fan-casing of a portable electric cleaner, having secured at one side the motor-housing 2, and having at the other side a central inlet-opening 3 to which is removably attached the hollow shank 4 of the floor-nozzle 5. The particular connecting means is unimportant but in the present case comprises a bracket 6 and cam-button 7 carried by the wall of the fan-casing on opposite sides of the opening 3 and adapted to engage suitable projections formed on the shank. The nozzle is formed with a narrow elongated inlet-mouth 8, transversely arranged relative to the axis of the fan 9, and the casing is provided with suitable wheels 10 whereby said opening is presented in operative relation to the working-surface. Pref-

erably the mouth 8 is displaced substantially from the vertical plane defined by the supporting-wheels so that the floor-covering can rise freely into sealing relation therewith and not be held down by the weight of the cleaner.

To loosen lint, threads, and the like from rugs and carpets a brush or other agitating member is requisite and experience shows that this device must be given a rapid movement of some kind independent of the bodily movement of the cleaner. According to my invention I effect this movement by means of an air-turbine operatively connected thereto in some manner, and I utilize the air required for the operation of this turbine to reduce the suction in the nozzle to such a point as shall prevent lifting or disarranging the rugs over which the device is moved.

In the form of the invention shown in Figs. 1 to 4, the bottom-wall of the nozzle is intersected by a horizontal cylindrical casing 12 arranged in a fore-and-aft position, and having threaded into its side walls two, opposite, horizontal pins 13 between whose points is supported a horizontal bearing-sleeve 14. Journaled in this sleeve is a rotatable shaft 15 having rigidly secured at its rear end the rotor of an air turbine, here consisting of a circular disk 16 having suitable blades 17 on one face, while secured to its opposite end is an eccentric weight 18. The brush consists of a plain, straight, horizontal, wooden element 20 loosely received in the mouth 8 and projecting from end to end thereof, being preferably guided between suitable fingers 21. Suitable tufts 22 of bristles are carried by this element 20, and the brush as a whole is attached to the sleeve 14 in some convenient way as by being impaled upon a projection 22 carried by a hollow shell 23 rigidly secured to the sleeve 14 and surrounding the eccentric weight 18.

Communicating with one side of the casing 12 opposite the blades 17 is an inlet-nozzle 24 terminating in a valve-chamber 25 in which is a valve-plate 26 normally held closed by a light spring 27, whose tension can be changed by means of a thumb-nut 28 screwed on the stem 29 with which said disk is provided. The tension can be shown visually by means of a suitable graduated scale 30 carried by the nozzle. When the cleaner is supported over a bare floor or held in the air the pressures outside and inside the nozzle are nearly equal, the plate 26 remains seated and the brush remains still, but as soon as the inlet-mouth 8 is sealed by a carpet sufficiently to raise the vacuum therein to the point corresponding to the tension of the spring 27, the valve 26 is opened and the

turbine 17 rotated, whereupon the unbalanced character of the weight 18 imposes a circular vibratory motion on the brush so that every point thereof executes a small orbit as indicated, for example, by the small circle *a* in Fig. 5. The vigor of this movement, or in other words the size of this orbit, can be increased if desired by providing the sides of the sleeve 14 with rubber cups 31 for engagement by the pins 13, but a high degree of agitation is produced without this refinement. The sleeve being pivoted on a horizontal axis, the brush floats freely on the floor covering so as always to bear down with the same weight despite variations in the thickness of the carpet. The rear end of the casing 12 is closed in any convenient manner, as by the pressed metal cap 32.

In Fig. 6 I have shown another construction embodying my improvements. In this modification the sleeve 14^a is rigidly mounted in a kind of casing 12^a, and the shaft 15^a is provided at its rear end with a turbine wheel having blades 17^a directly exposed to the apertures or ports 35 formed in the closure 32^a; while the opposite end of the shaft is offset to form a crank 36 journaled in the body 20^a of the brush. To keep the brush still when the suction is low or when the device is not in place on a sealing surface a slidable valve-plate 26^a is mounted on the exterior of the sleeve 14^a and forced towards closed position by spring 27^a.

In the form of the invention shown in Fig. 7 the casing 12^b is made vertical and provided with a vertical sleeve 14^b in which is mounted the vertical shaft 15^b having at its upper end the turbine blades 17^b and at its lower end the belt pulley 38 which is connected to the beater or agitator or brush by the belt 39. The casing 12^b is formed outside of the sleeve 14^b with inlet ports 35^b for air, while a disk valve 26^b supplied with a closing spring 27^b prevents operation of the turbine until a suitable pressure gradient is obtained. In the present embodiment, instead of a brush, I have shown a beater consisting of a rotor body 40 having tiny beaters 41 carried thereby which may be made either of wire or rubber or leather, etc.

In the form of device shown in Fig. 8 the nozzle wall is formed with a plurality of spaced air-inlet openings 42 covered internally by a flap-valve 43 suspended at its top from a horizontal hinge rod 44 and having a projecting spring arm 45 extending past the adjusting screw 46. The more this screw is turned down the more the opening of the valve is opposed, and by suitably setting the same the tendency of the cleaner to adhere to the carpet can be reduced. The air which rushes inwardly past the edge of this valve has a decided cleaning action due to its downward inclination even without any mechanical beater or brush, but may be assisted by any suitable mechanical device. Here I have shown a rotary beater consisting of a sheet metal stamping 47 folded about a wire 48 so as to produce a series of blades 49 separated by spaces in which are mounted the beaters 50. These blades are rotated by the entering air and operate the beaters.

All these devices have the advantage of requiring no connection of any kind with any of the operating mechanism, and are thus readily employed on a nozzle which is removable from the remainder of the cleaner. Most cleaners now made and sold have such an excess of power anyway that the energy required to operate the brush does not impair the cleaning action, but may actually assist the operation since oftentimes the suction is so great as to cause rugs to cling to

the cleaner mouth in a very annoying way. Furthermore this type of drive and mounting is not one which will unduly abrade or in any wise injure the floor coverings.

I have illustrated and described a plurality of alternative forms to indicate that I do not limit myself to any one form, arrangement, or mode of operation, nor do I limit myself in any other way except as specifically recited in my several claims which I desire may be construed each independently of limitations contained in other claims.

Having thus described my invention what I claim is:

1. The combination with the collecting nozzle of a vacuum cleaner of a supporting element pivoted thereto on an axis parallel to the plane of the inlet mouth, air suction means communicating with said nozzle, a brush carried by said element and located inside said inlet mouth, the pivot of said supporting element being spaced laterally from said brush, whereby said brush may rise and fall freely, and an eccentric and its driving motor carried by said supporting element and operatively connected to said brush in vibrating relation.

2. The combination with the collecting nozzle of a vacuum cleaner of a supporting element pivoted thereto on an axis parallel to the plane of the inlet mouth, air suction means communicating with said nozzle, a brush carried by said element and located inside said inlet mouth, the pivot of said supporting element being spaced laterally from said brush, whereby said brush may rise and fall freely, and an air motor and means operatively connecting said motor to said brush carried by said supporting element, the wall of said nozzle having an opening thereon for the admission of air to operate said motor.

3. The combination with the collecting nozzle of a vacuum cleaner, of a shaft journaled therein substantially parallel to the plane of the inlet mouth, a motor operatively connected to said shaft, a brush located inside said inlet mouth transversely to said shaft, power-transmitting provisions operatively connecting said motor and brush including an eccentric part for causing said brush to vibrate when said shaft is revolved, and a second motor and pump means for creating suction through said nozzle.

4. The combination with a vacuum cleaner nozzle having a narrow elongated downwardly facing mouth transversely arranged, of a brush in said mouth comprising a straight row of bristles, air suction means communicating with said nozzle, and air driven means for imparting to every portion of said brush a movement of rotation in a vertical plane which is parallel to the major dimension of said mouth.

5. In a vacuum cleaner nozzle, a brush mounted inside said nozzle adjacent to the inlet mouth for movement lengthwise of the nozzle in a plane perpendicular to the inlet mouth of the nozzle, an air brush turbine having its axis perpendicular to said brush, a brush carrying member directly connected to said turbine for imparting movement to said brush from said turbine, and air suction means communicating with said nozzle.

6. In a vacuum cleaner nozzle, a brush, means supporting said brush inside said nozzle adjacent to the inlet mouth, the supporting means being of such nature as to allow said brush to move up and down, means for driving said brush including a motor, said last named means being carried by

said supporting means and cooperating therewith to partly counterbalance the weight of said brush so that its downward pressure is due only to a part of its own weight, and air suction means communicating with said nozzle.

7. In a vacuum cleaner in combination, a suction pump, means for operating said pump, a nozzle operatively connected to the pump-inlet and having a narrow, elongated, downwardly-facing inlet-mouth transversely arranged, a brush carried by said nozzle comprising a straight row of bristles and located adjacent to the stream of entering air, and pneumatic means including a crank for vibrating said brush lengthwise of said mouth when said pump is operating.

8. In a floor cleaner, a support, an arm pivoted to said support upon a horizontal axis, a brush and bearing carried by said arm, a rotatable element carried by said bearing, an eccentric member carried by said element and means for rotating said element.

9. In a floor cleaner, a casing having a collecting nozzle formed with a narrow elongated mouth, a narrow elongated brush located in operative relation relative to said mouth, a supporting arm for said brush projecting perpendicularly therefrom and substantially parallel to the floor and means carried by said arm for vibrating said brush.

10. In a suction cleaner, in combination, a casing having a collecting nozzle formed with a narrow, elongated brush-chamber transversely arranged, a vibratory brush located in said brush-chamber and having sweeping portions adapted to agitate the surface of a floor cover, and operating means for said brush including a substantially horizontal rotatable element having its axis substantially perpendicular to said brush-chamber, an eccentric member carried by said element, means for communicating to said brush the vibratory motion created by the rotation of said eccentric member, means for rotating said rotatable element, and means for sucking air away from the vicinity of said brush, said element and brush being movably mounted relative to said casing to enable said brush to move up and down in accordance with inequalities of the working surface.

11. In a suction cleaner, in combination, a casing having a collecting nozzle formed with a narrow, elongated brush-chamber transversely arranged, said brush chamber having a downwardly-facing mouth, a vertically movable vibratory brush located in said brush-chamber and having sweeping portions adapted to engage a floor covering, and means for operating said brush including a substantially horizontal rotatable element having an eccentric member rotatable therewith, means supporting said element in said casing for vertical movement therein and also for rotation about its own axis, means for rotating said element, and means for communicating to said brush the vibratory movement produced by the rotation of said eccentric member.

12. In a suction cleaner, in combination, a casing having a nozzle formed with a narrow 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 member carried by said element, means for rotating said element, a brush located in operative relation to said

mouth, and operative connections from said element to said brush.

13. In a suction cleaner, in combination, a fan casing having a wall with an inlet opening formed therein, a fan and fan shaft in said casing, a nozzle removably secured to said casing, said nozzle having a part communicating with said opening and also having a narrow downwardly-facing brush-mouth arranged transversely of said axis and spaced forwardly from said wall, a brush in said mouth, a horizontal operating shaft for said brush journaled in said nozzle substantially parallel to the longitudinal axis of the cleaner and transverse to the mouth, means for rotating said last shaft, an eccentric member carried by said last shaft, and connections whereby the vibration production by said member is imparted to said brush.

14. In a suction cleaner, a casing having a collecting-nozzle and a fan-chamber and a motor-housing rigidly connected together, said nozzle having a brush-chamber therein formed with a narrow, transversely-elongated, downwardly-facing mouth, a brush located in said chamber and comprising a straight back strip and tufts of bristles depending therefrom, a substantially horizontal arm pivoted on a horizontal axis back of said brush-chamber, a rotatable fore-and-aft element rotatably carried by said arm, means for rotating said element, an eccentric member carried by said element and connections for communicating to said brush the vibration produced by said eccentric member.

15. In a suction cleaner, a casing comprising a fan-housing and a nozzle, said housing having a horizontal axis, and also having an inlet-opening in one side communicating with said nozzle, and said nozzle having a narrow, elongated mouth transversely arranged, the plane of said mouth being parallel to and displaced below the axis of said fan housing, and the rear lip of said mouth being parallel to and spaced forwardly from the side of said fan-housing, a brush parallel to and operatively associated with said mouth, a horizontal arm having said brush secured to its forward end and having its rearward end pivoted to a part of said casing on a horizontal axis, the rear wall of said nozzle having a pocket in which said arm is located, a rotatable element carried by said arm, means for rotating said element, and means whereby rotation of said element is caused to impart motion to said brush.

16. In a suction cleaner, the combination with a casing having a nozzle formed with a downwardly-facing narrow mouth transversely arranged, of a brush located inside said casing in register with said mouth, an elongated element having its axis substantially horizontal and perpendicular to said brush, an eccentric weight carried by said element near one end, a bearing for said element pivotally secured to said casing at a distance from said weight, means for rotating said element, and connections whereby the vibratory effect of said eccentric weight is communicated to said brush.

17. In a suction cleaner, a casing having a collecting-nozzle and a fan chamber, said nozzle having a brush-chamber therein formed with a narrow, downwardly-facing inlet-mouth which is transversely elongated relative to the axis of said fan-chamber, said mouth having spaced horizontal front and rear lips, a fan in said fan chamber, wheels carried by said casing whereby said lips are supported at a determined height above and parallel to the working surface, a brush

located in said brush-chamber in operative relation to said mouth, a substantially horizontal carrying arm extending through a chamber formed in said nozzle and pivoted to said casing at the rear of said brush chamber, a fore-and-aft shaft journaled to said arm, means for operating said shaft while leaving said arm free to rise and fall about its pivot, and operative connections whereby the motion of said shaft is communicated to said brush.

18. In a suction cleaner, a collecting nozzle, a brush located in operative relation thereto, a rotatable element, a support for said rotatable element movably secured to said nozzle, said rotatable element being rotatably mounted relative to said support, and said brush having a limited freedom of movement relative to said nozzle, means for revolving said rotatable element, an eccentric member carried by said element, and means for communicating to said brush the vibratory motion produced by said eccentric.

19. In a floor cleaner, a casing, a brush yieldingly mounted relatively to said casing, a bearing member operatively connected to said brush, a rotatable element carried by said bearing member, an eccentric member carried by said element, and means for rotating said element.

20. In a suction cleaner, in combination, a casing having a narrow elongated brush mouth therein defined between lips which are presented to the working surface, carrying wheels attached to a part of said casing which is rigid with said lips and supporting said lips at a determined distance above the working surface, air suction producing means communicating with said brush mouth, a brush in said mouth, a substantially horizontal arm pivoted to said casing at a distance from said brush and movable independently of said lips, said arm being perpendicular to said brush, power transmission means operatively connected to said air suction producing means and having a part carried by and arranged lengthwise of said arm, means for readily disabling the driving connection between said air suction producing means and said power transmission means, means for communicating to said brush the motion of said power transmission means and also supporting said brush to rise and fall with the movement of said arm, and means carried by said casing for housing said arm and said power transmission means.

21. The combination with the collecting nozzle of a vacuum cleaner, of a shaft journaled therein substantially parallel to the plane of the inlet mouth, a motor operatively connected to said shaft, a brush located inside said inlet mouth transversely to said shaft, power-transmitting provisions operatively connecting said motor and brush including an eccentric part for causing said brush to vibrate when said shaft is revolved.

22. In a suction cleaner, the combination with a collecting nozzle formed with a narrow downwardly facing inlet mouth transversely arranged, of a shaft journaled in said nozzle, a brush lo-

cated inside said nozzle above said inlet mouth, an eccentric member carried by said shaft, means for communicating to said brush the vibratory effect of said eccentric member, and motor means for driving said shaft.

23. The combination with a vacuum cleaner nozzle having a narrow elongated downwardly facing mouth transversely arranged, of a brush in said mouth comprising a straight row of bristles and means for imparting to every portion of said brush a movement of rotation in a vertical plane which is parallel to the major dimension of said mouth.

24. In a suction cleaner, a casing comprising a collecting nozzle having an inlet mouth and a fan chamber having an axis substantially parallel to the plane of said mouth, means for detachably securing said nozzle in communicating relation with said fan-chamber, a horizontal shaft in said fan chamber, a fan in said chamber carried by said shaft, driving means for said shaft and fan, a brush located in operative relation relative to the inlet mouth of said nozzle, an arm pivoted to said casing and supporting said brush, power transmission means operatively connected to said driving means and having a part extending axially along said arm for actuating said brush, said power transmission means having a disconnectible driving connection with said driving means and serving to actuate said brush without impeding the pivotal movement of said arm whereby said brush is enabled to assume different vertical positions relative to the plane of said inlet mouth in accordance with inequalities of the floor covering, and means carried by said casing for housing said arm and said power transmission means.

25. In a suction cleaner, a nozzle having front and rear walls defining therebetween a narrow transversely elongated chamber, the rear wall having a hollow pocket formed therein, a substantially horizontal shaft journaled in said pocket, a bearing for said shaft pivoted to said nozzle transversely of the shaft axis, an air turbine carried by one end of said shaft, an eccentric member carried by the other end of said shaft, an apertured member located in communication with said pocket, the apertures being adjacent to the turbine blades, a brush in said chamber, operative connections for transmitting to said brush the vibration produced by said eccentric member, and means for establishing communication between said chamber and a suction producing mechanism.

26. In a suction cleaner, a nozzle, a brush carried thereby, means including a mounting pivoted for movement about a horizontal axis for flexibly supporting said brush to enable it to move relative to said nozzle in accordance with inequalities of the shape and level of the surface being cleaned, and means superimposing upon the floating movement of said brush a constantly vibratory movement.

JAMES B. KIRBY.

CERTIFICATE OF CORRECTION.

Patent No. 2,107,571.

February 8, 1938.

JAMES B. KIRBY.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 24, claim 1, for "carired" read carried; page 3, second column, line 17, claim 13, for "production" read produced; page 4, second column, line 54, claim 25, for "producting" read producing; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of March, A. D. 1938.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.