March 7, 1933. D. G. SMELLIE 1,900,886

SUCTION CLEANER

Filed May 28, 1930 2 Sheets-Sheet 1

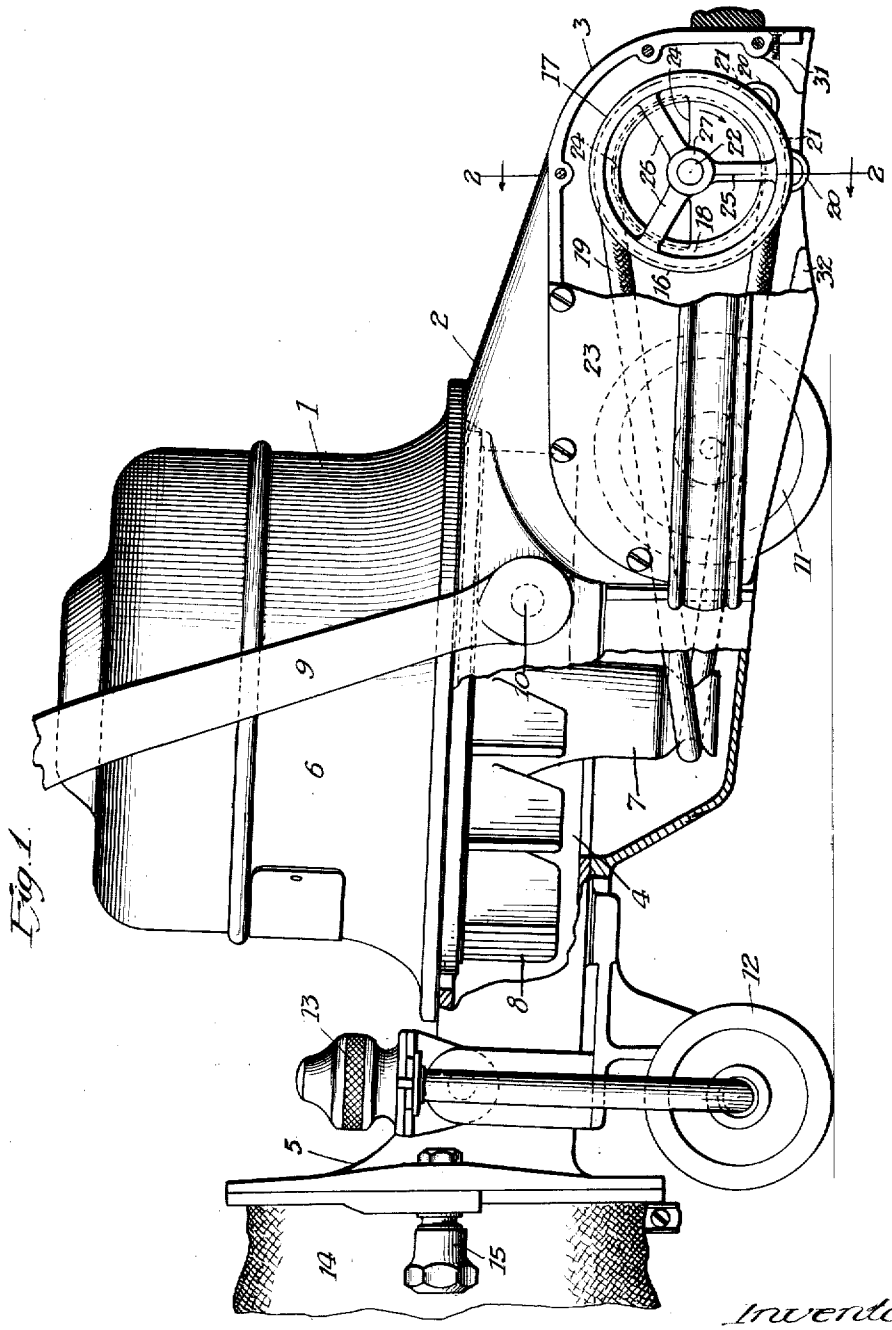

Fig. 1.

Witness
R. B. Davison

Inventor
Donald G. Smellie.
By Harry S. Dsmarse
Atty.

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SUCTION CLEANER

Filed May 28, 1930 2 Sheets-Sheet 2

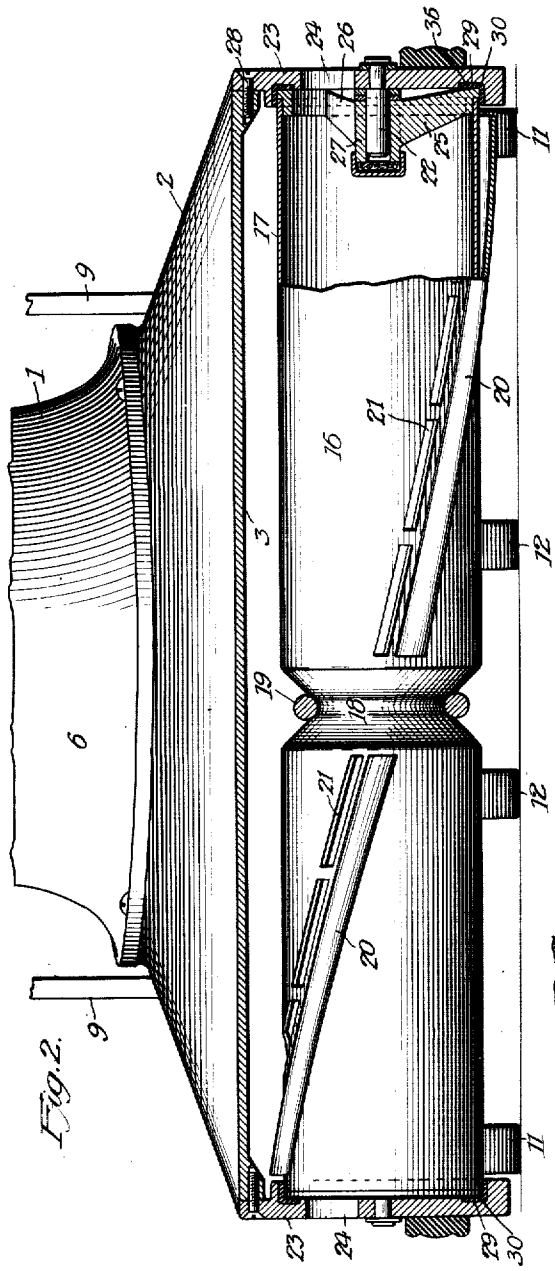

Fig. 2.

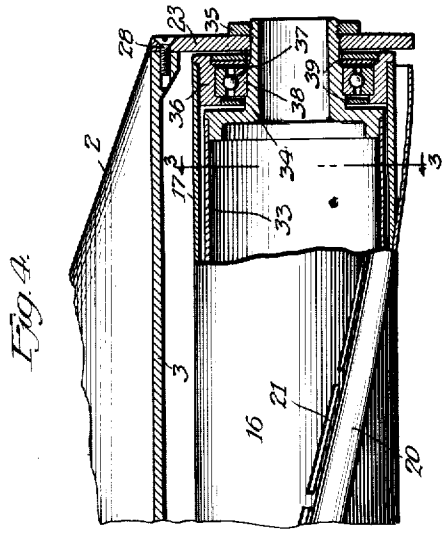

Fig. 4.

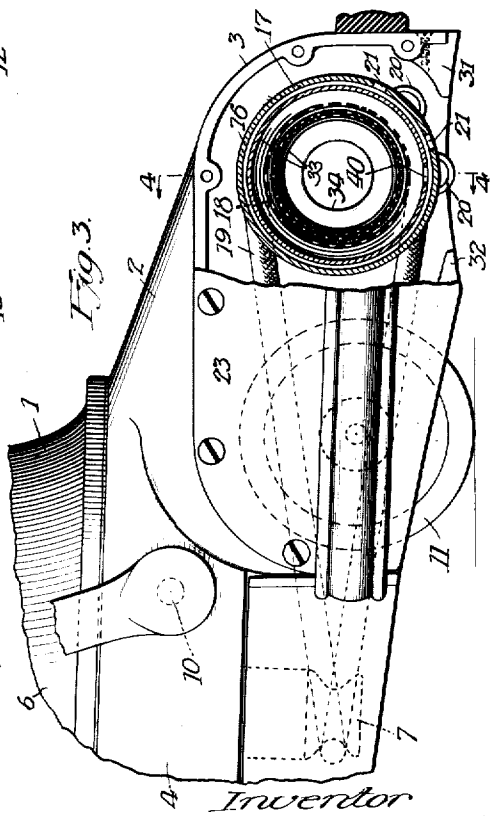

Fig. 3.

Witness
R. B. Davison.

Inventor
Donald G. Smellie
By Harry S. Dumaresq
Atty.

Patented Mar. 7, 1933 1,900,886

UNITED STATES PATENT OFFICE

DONALD G. SMELLIE, OF CANTON, OHIO, ASSIGNOR TO THE HOOVER COMPANY, OF NORTH CANTON, OHIO, A CORPORATION OF OHIO

SUCTION CLEANER

Application filed May 28, 1930. Serial No. 456,390.

The present invention relates to suction cleaners and more particularly to new and novel improvements in suction cleaner construction making possible increased cleaning efficiency. The invention is characterized by the change in the direction of air flow from that found in the ordinary cleaner to a course by which the air enters the nozzle of the suction cleaner through the agitating member itself and strikes the surface covering undergoing cleaning at the point of agitation. The invention is further characterized by a construction in which a body of air at substantially atmospheric pressure is found within the nozzle which contains air at reduced pressure.

The primary object of the present invention is the provision of a suction cleaner of greater cleaning efficiency through the incorporation therein of new and novel agitating means. A further object is the provision of a suction cleaner in which the surface agitation is provided by means of a hollow agitator mounted for continuous rotation which contains a body of air at atmospheric pressure. Another important object of the present invention is the provision of a positive agitation suction cleaner in which the agitating member serves as the entrance for the cleaning air. A still further object is the provision of a suction cleaner in which cleaning air enters the nozzle from a rotary agitator and is directed to the point of surface agitation. Still further and more specific objects will appear upon reading the specification taking into consideration the drawings annexed.

Referring to the drawings:—

Fig. 1 discloses a side view of a suction cleaner embodying the present invention;

Fig. 2 is a front view, of the suction cleaner shown in Fig. 1, showing a cross section of the front of the nozzle upon the line 2—2 of Fig. 1;

Fig. 3 is a partial end view of a suction cleaner embodying the present invention with certain parts broken away and showing the agitator upon the line 3—3 of Fig. 4;

Fig. 4 is a partial front view of the showing of Fig. 3 showing the end of the agitator upon the plane 4—4 of Fig. 3.

Referring now to Figs. 1 and 2 in particular, the reference character 1 refers to the suction cleaner generally which comprises the usual parts including the main casting 2 which forms the nozzle 3, fan chamber 4 and exhaust outlet 5; the motor casing 6 enclosing a driving motor, not shown; motor shaft 7 projecting through the fan chamber and upon which is mounted the suction fan 8; the bail 9 which is pivoted to the cleaner at 10; the front supporting wheels 11 which support the front end of the cleaner and the rear supporting wheels 12 with their height-adjustment mechanism, indicated generally by the reference character 13, which provides means for raising and lowering the nozzle mouth relative to the surface covering by pivoting the front end of the cleaner about the front supporting wheels 11; and the dust receptacle 14 attached to exhaust outlet 5 by means 15. The aforedescribed parts of the suction cleaner are found in the ordinary cleaner and their general arrangement forms no part of the present invention.

Mounted for continuous rotation, in the sense of being always in the same direction, within the nozzle 3 in place of the usual rotary agitator is the agitator 16 comprising a cylindrical hollow body member 17 which extends substantially the width of the nozzle 3. Positioned approximately at the longitudinal center of the agitator 16 is the pulley 18 adapted to receive the belt 19 which is driven from the motor shaft 7. Positioned upon the surface of the cylindrical body 17 and extending helically therearound substantially the length thereof are the beater bars 20, 20. Closely adjacent the beater bars and extending parallel thereto are slots or openings 21, 21 formed in the hollow body 17 connecting the interior of the hollow agitator 16 and the enclosing nozzle 3. Both the beater bars 20 and the slots 21 are interrupted between their ends by the presence of the belt receiving pulley 18. Agitator 16 is supported within the nozzle 3 at each of its ends by means of a supporting pin 22 which is carried by a removable end plate 23. Open-

ings 24 are provided through each of the end plates 23 for a purpose hereinafter explained. An end support 25 is fixedly secured to each end of the body 17 and comprises radial spokes 26, 26 which are formed with a bearing 27 at their point of intersection. Bearing 27 is rotatably mounted upon the supporting pin 22 and so permits rotation of the agitator. Positioned in each of the end plates 23, which are secured to the nozzle 3 by securing means 28 is a cylindrical inset seat 29 within which is positioned a gasket member 30. The end of the agitator 16 which includes the end support 25, extends closely adjacent and slightly within the seat 20 in end plate 23 and slidingly contacts the sealing gasket 30 thereby preventing air leakage at the ends of said hollow agitator.

Carried by nozzle 3 are members 31 and 32 comprising the forward and rear nozzle lips respectively of the cleaner. Nozzle lips 31 and 32 are, in comparison with ordinary nozzle lips, found upon a suction cleaner, of relatively great width and of a species known as broad sealing lips. The lips are provided with surface contacting surfaces which are curved to conform to the arc of the displaced surface covering as it is lifted by the suction in the nozzle and are adapted, because of their relatively great width and the resulting close seal which they make with the surface covering to prevent substantially the entrance of air thereunder into the suction nozzle after the contact is once made.

In the operation of the suction cleaner, constructed in accordance with the aforedescribed invention, the rotation of the suction fan 8 within the fan chamber 4 draws air from the nozzle 3 through said fan chamber 4 and exhausts same through exhaust outlet 5 into the discharge bag 14. The suction creates a reduced pressure within nozzle 3 and as the cleaner passes over the surface covering said covering is lifted upwards into contact with the lips 31 and 32 of said nozzle by the difference in pressure acting upon the two sides thereof, namely, the atmospheric pressure on the underside of said covering and the reduced nozzle pressure upon the upper side thereof. Said covering tightly contacts the sealing lips 31 and 32 and is bowed up therebetween and is contacted by the agitator 16. With the tight seal made between the surface covering and the nozzle lips the entrance of air therebetween, in response to the demand of the rotating suction fan, is substantially cutoff and air is drawn into the nozzle from the hollow agitator 16 through the slots or openings 21, 21 having entered said agitator at the ends thereof through the openings 24 in the end plates 23 of the nozzle. As the cross-sectional area of the slots 21, 21 is relatively small the air rushes from the agitator into the nozzle at a high velocity and with great force. The agitator 16 being connected to the driving motor through the pulley 18, belt 19 and motor shaft 7, is rotated at a relatively high speed and, as the projecting beater bars 20 upon the cylindrical surface 17 thereof contact the displaced surface covering between the lips 31 and 32, said covering is positively and violently agitated and vibrated in a vertical plane. The upstanding pile or nap of said covering is, in the bowed or arced portion between the lips 31 and 32, flexed and vibrated and the foreign particles which are lodged therein are displaced. As the agitator 16 is rotated in a clockwise direction, as viewed in Fig. 1, the surface covering is subjected, immediately following its agitation by a beater bar 20, to a blast of high velocity of air discharged from a slot 21. The pile being flexed and spread apart as a result of the bowed position of the surface covering permits the discharged air to have free access to the base thereof and to remove all foreign particles including those which are dislodged and broken by the agitation. Passage of air into the nozzle from those portions of the slots 21, 21 which are not facing the surface covering serves to answer the demand of the suction fan and to carry away to the dirt receptacle 14 the foreign matter dislodged from the covering.

Referring now to Figs. 3 and 4, a modification of the present invention is disclosed in which means are provided which substantially restrict the passage of air from the agitator into the nozzle to the direction of the surface covering. In the present embodiment the agitator 16 comprises a cylindrical body 17 having upstanding helically extending beater bars 20, 20 and slots or openings 21, 21. Positioned within the cylindrical body 17 and extending substantially the length thereof is a stationary shell or housing 33 which is carried by hollow end-supporting members 34 which are carried by the end plates 23 and secured in position thereon by means 35. Agitator 16 is rotatably mounted within the nozzle through the securing of the ends of body member 17 to the outer race 36 of a bearing indicated generally by the reference character 37 and, in the inner race 37 of which is non-rotatably carried by the end-supporting member 34 of the housing 33. Seals or gaskets 39 are provided at the sides of bearing 37 to prevent the passage of dirt-laden air therethrough. Housing 33 is provided with a downwardly opening slot 40 which extends the length of the slots 21, 21 and which provides the only means of exit from the housing for the air which has entered through the hollow member 34 at the ends thereof.

In the operation of the cleaner, constructed in accordance with this latter embodiment, the passage of air under the nozzle lips is substantially prevented by the seal made

by said lips with the surface covering and the air is forced to enter the nozzle 3 through the hollow agitator 16. The presence of the housing 33 however, with its slot 40 permits the air to be discharged from said hollow agitator into the suction nozzle only when the spirally extending slots 21, 21 of said agitator extend across said slot. This restriction of the air discharged from the agitator 16 materially reduces the available area of discharge and results in a jet of air of extremely high velocity which is always directed at the surface covering. The rotation of the agitator 16 results in the alternate movement from left to right, and vice versa, across the nozzle mouth of a diamond shaped port of discharge as said spiral slots 21, 21 are rotated past the stationary slot 40 of the housing 33.

Having clearly set forth and described my invention, I claim:—

1. In a suction cleaner, a suction nozzle, means to create a reduced pressure in said nozzle, a surface contacting agitator mounted for continuous rotation within said nozzle and interiorly connected to the atmosphere, said agitator comprising a body having an opening therein and a beater bar upon said body extending parallel to said opening, said beater bar and said opening extending helically upon said agitator body, and means to actuate said agitator.

2. In a suction cleaner, a suction nozzle, means to exhaust air from said nozzle, broad sealing lips on said nozzle adapted to contact a surface covering and substantially limit the flow of air therebetween, and a surface-contacting and agitator mounted for continuous rotation within said nozzle and interiorly connected to the atmosphere, said agitator comprising a body extended substantially into the plane of the nozzle lips and having an opening therein through which air may enter the suction nozzle, and means to actuate said agitator.

3. In a suction cleaner, a suction nozzle, means to exhaust air from said nozzle, a surface-contacting agitator mounted for continuous rotation within said nozzle and interiorly connected to atmosphere, said agitator comprising a body having an opening therein, and means to prevent escape of air from said agitator to said nozzle except in the direction of the surface covering undergoing cleaning, and means to rotate said agitator.

4. In a suction cleaner a suction nozzle, suction-creating means connected to said nozzle, a surface-contacting agitator mounted for continuous rotation within said nozzle and interiorly connected to the atmosphere, said agitator comprising a body having an opening therein, and means to prevent escape of air from said agitator to said nozzle except in the direction of the surface covering, said means comprising a stationary shell within said agitator having a longitudinal opening along the bottom thereof and means to rotate said agitator.

5. In a suction cleaner, a suction nozzle, suction creating means connected to said nozzle, an agitator mounted for continuous rotation within said nozzle and interiorly connected to the atmosphere, said agitator comprising a body having a helically-extending opening therein, means to restrict the passage of air from said agitator to said nozzle to a downwardly direction, said means comprising a stationary shell with a downwardly opening slot within said agitator adapted to prevent the escape of air therefrom except at the point of intersection of the opening end of the slot, and means to rotate said agitator.

6. In a suction cleaner, a suction nozzle adapted to contact a surface covering undergoing cleaning, means to create a reduced pressure in said nozzle, a rotatable element in said nozzle adapted to contact a surface covering undergoing cleaning and including means to direct air at substantially atmospheric pressure into said nozzle at substantially the point of contact of said element and the surface covering undergoing cleaning, and means to rotate continuously said element.

7. In a suction cleaner, a suction nozzle, means to create a reduced pressure in said nozzle, a surface-contacting agitator mounted for continuous rotation within said nozzle and interiorly connected to the atmosphere, said agitator including rigid surface-contacting means to agitate the covering and means to exhaust air immediately adjacent the surface-contacting portion of said agitating means whereby to remove the foreign matter in a surface covering dislodged by said means, and means to rotate said agitator.

8. In a suction cleaner, a suction nozzle having lips, means to create a reduced pressure in said nozzle, a surface-contacting agitator mounted for continuous rotation within said nozzle and interiorly connected to the atmosphere, said agitator including an elongated rigid beater element extended in certain positions substantially into the plane of the nozzle lips and second means to direct air from the interior of said agitator against a surface covering undergoing cleaning at the point of surface contact of said element whereby to remove the foreign matter in said covering dislodged by said element, and means to rotate said agitator.

9. A suction cleaner construction as set forth in claim 8 characterized by the fact that means are provided to prevent the passage of air through said second means except when said agitating element is in contact with a surface covering undergoing cleaning.

10. In a suction cleaner, a suction nozzle having surface-contacting lips, an agitator in

said nozzle mounted for continuous rotation and interiorly connected to atmosphere, said agitator comprising an elongated hollow cylindrical body extended substantially into the plane of the nozzle lips and having an opening in its surface, said agitator including a surface-contacting agitating element, and means to rotate said agitator.

11. A suction cleaner construction as set forth in claim 10 characterized by the fact that means are provided to prevent the passage of air through the opening in said agitator except when said opening is positioned opposite the surface covering undergoing cleaning.

12. A suction cleaner construction as set forth in claim 10 characterized by the fact that an elongated smooth rigid bar is extended longitudinally of said agitator at a relatively small height above the surface thereof, and by the further fact that said opening is a slot extended closely adjacent said element.

Signed at North Canton, in the county of Stark and State of Ohio, this 15th day of May, A. D., 1930.

DONALD G. SMELLIE.

CERTIFICATE OF CORRECTION.

Patent No. 1,900,886. **March 7, 1933.**

DONALD G. SMELLIE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, line 38, claim 2, strike out the word "and"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 23rd day of May, A. D. 1933.

M. J. Moore.

(Seal) **Acting Commissioner of Patents.**

said nozzle mounted for continuous rotation and interiorly connected to atmosphere, said agitator comprising an elongated hollow cylindrical body extended substantially into the plane of the nozzle lips and having an opening in its surface, said agitator including a surface-contacting agitating element, and means to rotate said agitator.

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