Dec. 20, 1932. D. G. SMELLIE 1,891,503

SUCTION CLEANER

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Fig. 1.

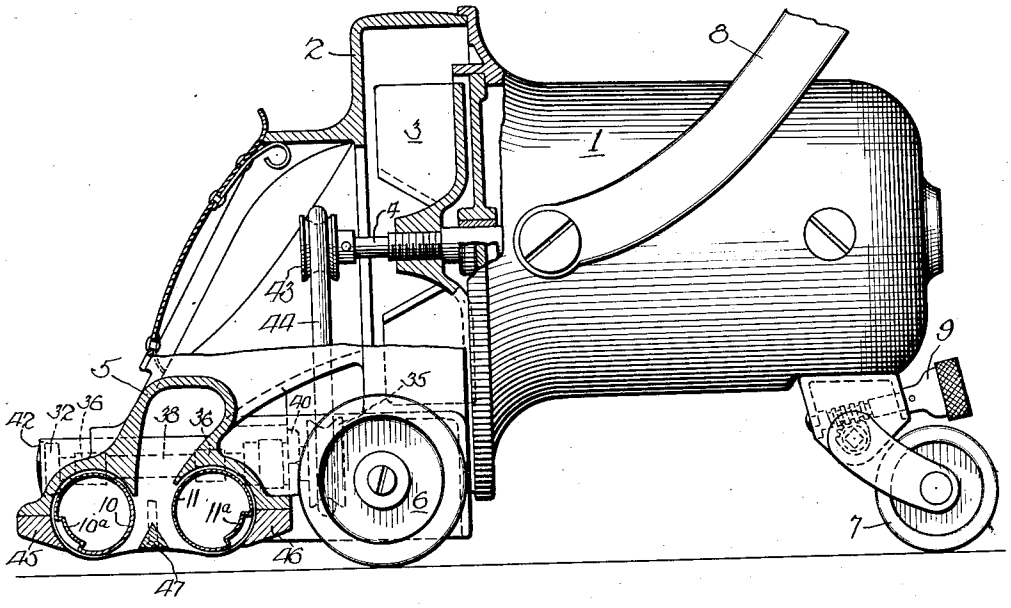


Fig. 2.

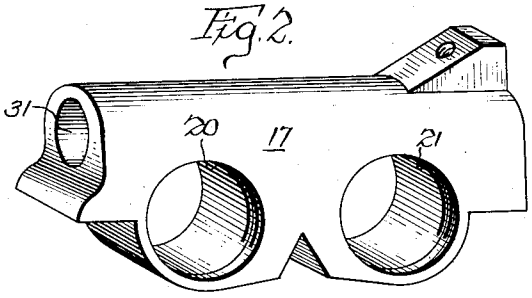
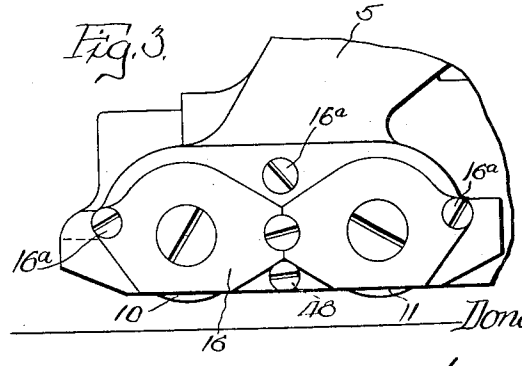


Fig. 3.



Inventor:
Donald G. Smellie.

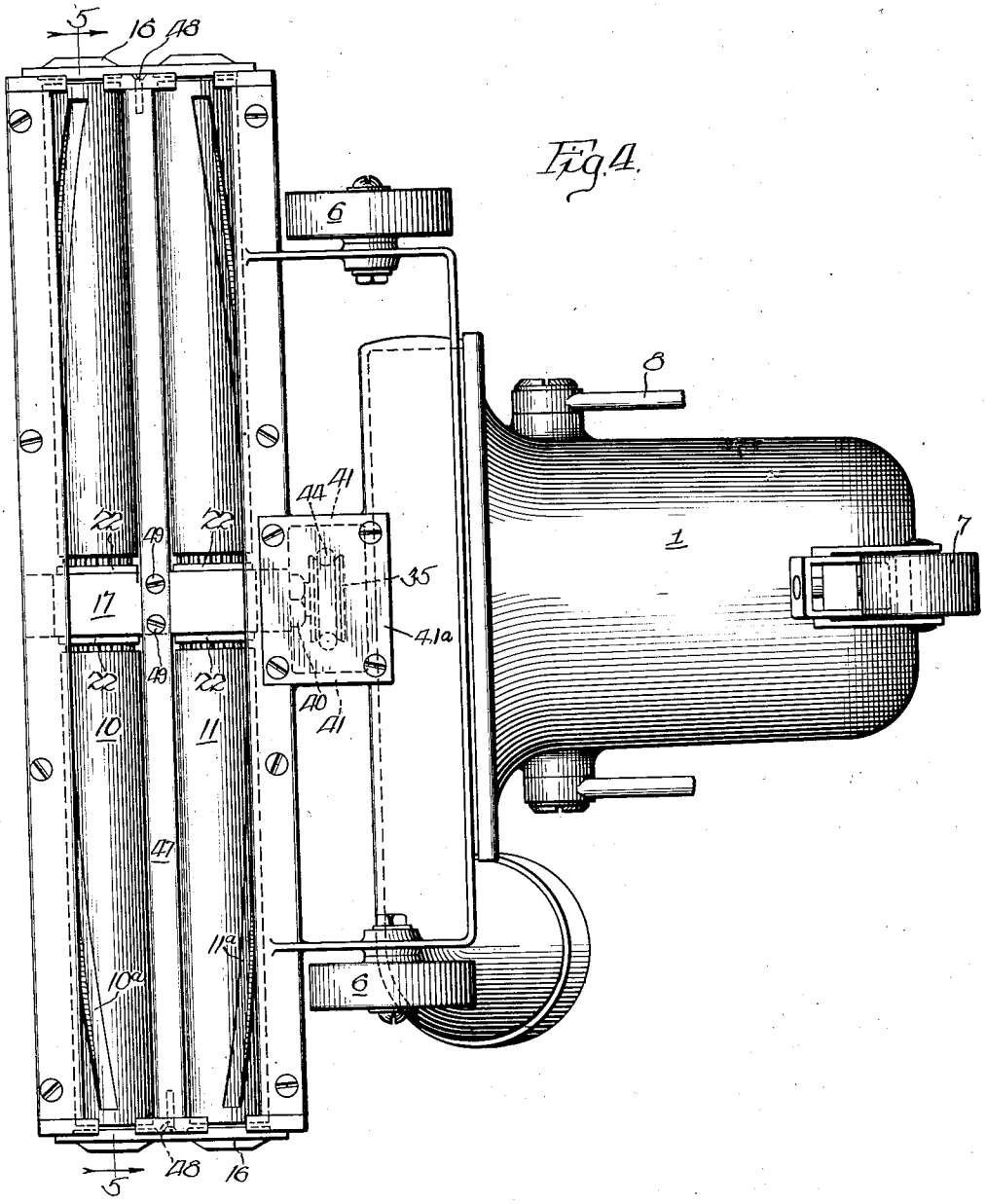
By Harry S. Duncan
Atty.

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SUCTION CLEANER

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Fig. 4.



Inventor:
Donald G. Smellie:

By Harry S. Newcarr Atty.

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SUCTION CLEANER

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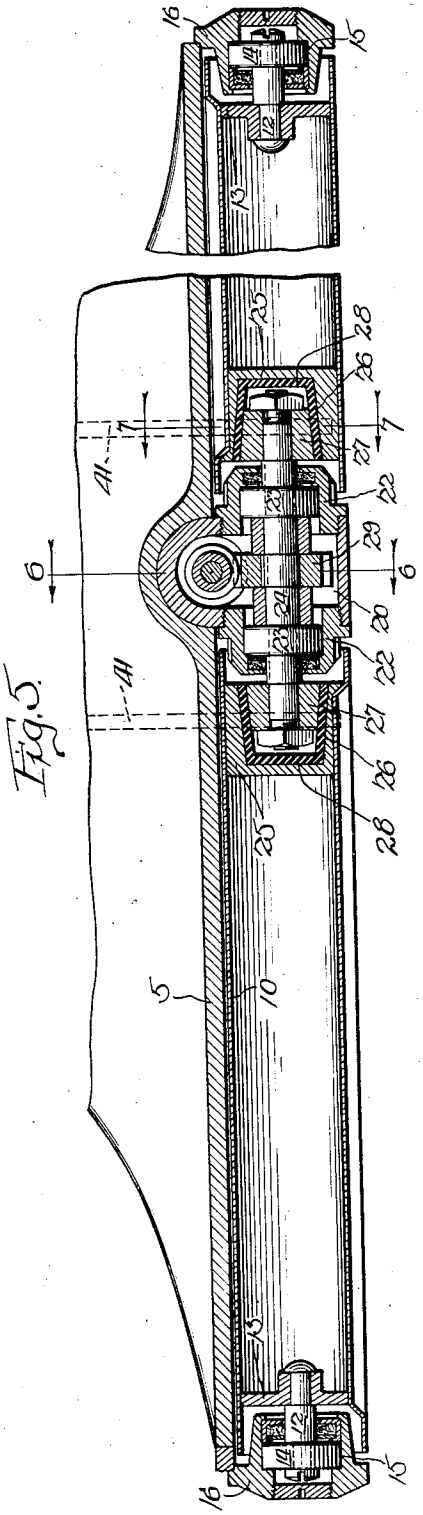


Fig. 5.

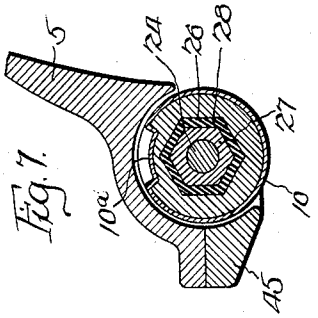


Fig. 7.

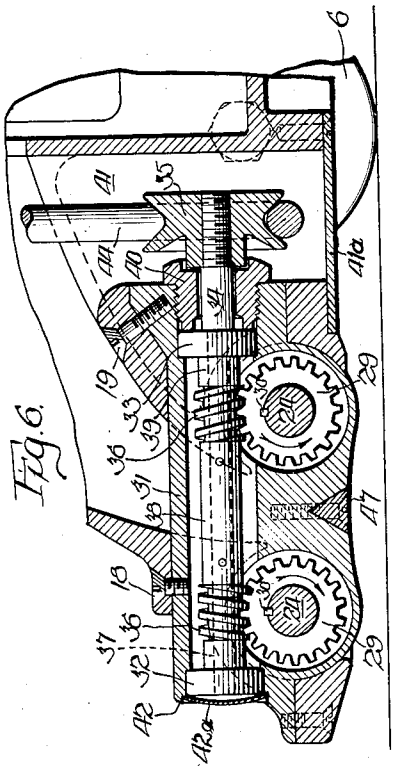


Fig. 6.

Inventor:
Donald G. Smellie:
By Harry S. Demaree Atty.

Patented Dec. 20, 1932

1,891,503

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 December 1, 1930. Serial No. 499,134.

The present invention relates to suction cleaners in general and in particular to a new and novel arrangement of surface-covering agitators in a suction cleaner. More specifically the invention relates to a new and improved suction cleaner construction in which the surface covering agitators form the lips of the suction cleaner nozzle.

In a suction cleaner of the type adapted to remove the maximum amount of foreign matter embedded in a surface covering, a prerequisite of which is the incorporation of positive agitating means, it is extremely desirable to have the point of maximum surface covering agitation coincident with the point of maximum air cleaning effectiveness. In a suction cleaner constructed in accordance with the present invention this desirable condition has been achieved through the elimination of the ordinary stationary nozzle lips and the substitution therefor of positive agitating means. In its preferred embodiment the agitators which form the lips of the suction cleaner nozzle are of the rotary type and, as they define the limits of the suction nozzle mouth, perforce contact the surface covering at the exact points at which cleaning air contacts said covering in gaining entrance into the cleaner nozzle in response to the reduced pressure created therein by the suction-creating fan.

It is an object of the present invention then to provide a new and improved suction cleaner. It is a further object to provide a suction cleaner having the desirable characteristic of having the point of maximum agitation exactly coincident with the point of maximum air cleaning effectiveness. Still another object is the provision, in a suction cleaner, of rotary agitating nozzle lips. Other and more specific objects will appear upon reading the following specification and considering in connection therewith the attached drawings.

Referring now to the drawings in which the preferred embodiment of the present invention is disclosed:

Fig. 1 is a side elevation of a suction cleaner in which the present invention is incorporated with certain parts broken away and shown in section.

Fig. 2 is a view in perspective of a detail.

Fig. 3 is a partial end view of a suction cleaner nozzle.

Fig. 4 is a bottom view of the cleaner shown in Fig. 1.

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

Fig. 6 is a section upon the line 6—6 of Fig. 5.

Fig. 7 is a partial section upon the line 7—7 of Fig. 5.

The present invention is disclosed embodied in a suction cleaner which comprises, in its general outline, the parts usually found in a suction cleaner including a motor casing 1, which houses a driving motor which is not shown; a fan chamber 2 housing a driven fan 3 mounted upon the extended motor shaft 4; a suction nozzle 5 comprising a mouth and a suction conduit; front and rear supporting wheels 6 and 7 which serve to movably support the cleaner upon a supporting surface; and a handle 8 pivotally attached to the motor casing 1 which provides means by which the cleaner may be propelled over the surface covering by the operator. Rear supporting wheel 7 is provided with adjusting means, which are indicated generally by the reference character 9, by which the nozzle 5 may be adjusted vertically relative to the covering undergoing cleaning by means of raising and lowering the rear supporting wheel resulting in the pivoting of the entire cleaner about the front supporting wheels as an axis. The foregoing details are parts of the usual suction cleaner and no invention is here claimed in their general arrangement.

In the place of the usual stationary nozzle lips defining the forward and rear edges of the nozzle 5 are found transversely extending rotary agitators indicated by the reference characters 10 and 11. Each agitator 10 and 11 is formed of two sections, each of which is rotatably supported at its ends. At the outer end of each section of each agitator, they being similarly formed and supported, a stub-shaft 12 is non-rotatably mounted in an end plate 13, as is clearly shown in Figure 5 relative to agitator 10. The opposite end of each shaft 12 is rotatably mounted in a

bearing 14 carried in a suitable bore 15 formed in the removable nozzle end plate 16 which is held as by screws 16*a*, 16*a*, to the nozzle end.

At substantially the longitudinal center of the nozzle a removable housing 17, clearly shown in Fig. 2, is positioned and carried by means of screws 18 and 19 extending through the nozzle walls. Housing 17 is provided with two transverse bores 20 and 21 which are in axial alinement with the agitators 10 and 11 and have their opposite ends threaded to form seats for the bearing-supporting members 22, 22 etc. which carry bearings 23, 23 etc. in which are rotatably supported the longitudinally extending shafts 24, 24 etc. The opposite ends of shafts 24, 24 etc. are non-rotatably carried within the end walls 25, 25 etc., of the inner ends of the opposing sections of each of the agitators 10 and 11. In order to reduce vibration in the driving mechanism from the agitator and to correct for any disalinement each end plate 25 is formed with a converging hexagonal seat 26 which receives a similarly shaped member 27, 27 etc. carried by each shaft 24 in non-rotatable relation, each member 27 being resiliently spaced from its seat 26 by a rubber gasket indicated by the reference character 28.

Positioned within the bores 20 and 21 of the housing 17 and carried by the shafts 24, 24 are gears 29, 29 which are non-rotatably mounted upon said shafts as by keys 30, 30. Each of the gears 29, 29 extend, at their tops, within bore 31 in the housing 17 which extends perpendicularly to the bores 20 and 21 and is open thereto at the points of intersection. Rotatably mounted in bore 31 on bearings 32 and 33 is the shaft 34 which extends the length of the bore and through the rear end thereof where it carries a pulley 35. Within the bore 31 on the shaft 34 are mounted suitable worm gears 36, 36 which are spaced by suitable rigidly attached spacing members 37, 38 and 39. Shaft 34 is suitably retained within the bore 31 by means of a nut member 40 which is threaded into the rear end of bore 31 contacting bearing 33 and by a compression plug or disc 42*a* which fits within a suitable seat 42 formed at the outer end of bore 31, and which contacts the supporting bearing 32.

The pulley 35 carried at the rear end of shaft 34 is positioned within a pocket or housing formed immediately in the rear of suction nozzle 5 by the vertically extending walls 41, 41 positioned between the nozzle 5 and the fan chamber 2. The lower or bottom side of this housing is closed by a removable member 41*a* attached to the fan chamber 2 and which may be detached in the event that it is desired to change the belt upon the driving pulley 35. Positioned immediately above the pulley 35 and carried upon the extended end of the motor shaft 4 is a driving pulley 43 which, through being connected by means of a belt 44 to the pulley 35, serves to transmit the rotating torque of the suction cleaner motor to the shaft 34 within housing 17.

The front and rear walls of the nozzle extend down into close proximity to the agitators 10 and 11 immediately thereabove and are suitably curved and extend around the outside of said agitators to substantially the plane of their axes. In order to extend the area of this overlying relationship detachable bottom sections 45 and 46 are provided for the front and rear nozzle walls respectively which form continuations thereof and which, through being demountable, permit the removal of the agitators downwardly in the dismemberment of the cleaner. It is the function of the curved nozzle walls to so closely enclose the surface-contacting agitators that substantially no air passes between them and the enclosed agitators. In order that this desirable relationship be satisfactorily attained it is necessary that each surrounding nozzle wall to be spaced but a minute distance from the periphery of the agitator making it desirable to use agitators of the recessed or depressed beater element type. The beater elements on the agitator are indicated by the reference characters 10*a* and 11*a* and are shown in the present embodiment as extending helically on the agitator surface. A beater or agitator of the recessed type functions upon a principle different than that on which the common raised or protruded beater type agitator operates. In surface-covering agitation by a recess beater agitator the surface covering is drawn against the surface of the agitator by the suction of the cleaner. Upon the contact of the surface covering by the forward end of the recessed beater the covering is permitted to be further lifted by the suction, through the absence of a restraining force. This further movement places the surface covering within the periphery of the agitator body and upon continued rotation the rear edge of the depressed beater contacts the lifted surface covering forcefully returning it to its former position. It is readily understood that with high speed rotation that the surface agitation obtained by means of such an agitator is substantially the equivalent of that obtained by the common agitator in which the beater beating element protrudes above the surface of the agitator.

In order to limit the displacement of the surface covering within the nozzle between the rotary lips in response to the high vacuum a spacer bar, which is indicated by the reference character 47, is provided in substantially the plane of the lines of surface contact of said lips. This spacer is detachably supported at its ends by screws 48, 48 and at its center by means of screws 49, 49 and can be removed, similarly to the lower sections 45

and 46 of the nozzle walls if it is desired to remove either agitator.

In the operation of the cleaner constructed in accordance with the present invention, upon the rotation of the suction motor the suction-creating fan 3 creates a reduced pressure within the nozzle 5. Upon the reduction of the pressure in the nozzle 5 the surface covering therebelow is forced upwardly by the greater pressure of the exterior atmosphere and contacts the periphery of the rotary lips 10 and 11, it being observed that they form the lowest points of the nozzle extending below sections 45 and 46. Upon making contact with the rotary lips 10 and 11 the surface covering is violently agitated as those lips are rotated by driving force received from the cleaner motor through shaft 4, the driving pulley 43, the belt 44, the driven pulley 35 which is non-rotatably carried upon the shaft 34, and the worm gears 36, 36 which in turn rotate the gear 29, 29 non-rotatably mounted upon the agitator-carrying shafts 24, 24. The extremities of shafts 24, 24, being non-rotatably associated with the inner ends of each of the half-sections of the agitators 10 and 11 through the resilient connections formed by the seats 26, the rubber gasket 28, and the hexagonal nut 27, serve to rotate said agitators to accomplish the aforedescribed agitating function. The air which enters the nozzle 5 in response to the demand created therein by the suction-creating fan 3 passes between the rotary lips 10 and 11 and the surface covering which they contact and of necessity passes the point at which the surface covering is receiving its agitation thereby accomplishing the desirable feature of making coincident the point of maximum surface agitation and the point of air cleaning effectiveness, it being recognized that the point at which the cleaning air passes under the nozzle lips is that point at which it is most effective.

I claim:—

1. A suction cleaner comprising a suction conduit, means to draw a cleaning fluid thru said conduit, a rotary surface-contacting agitator forming a lip of the mouth of said conduit, and means to rotate said agitator, characterized by the fact that said cleaning fluid passes under said agitator in gaining entrance to said conduit.

2. In a suction cleaner, a nozzle having a rotary nozzle lip, an agitating element carried by said lip, and means to rotate said lip.

3. In a suction cleaner a driving motor, a nozzle having a rotatably mounted surface-agitating nozzle lip, and power-transmitting means operatively connecting said lip to said driving motor.

4. In a suction cleaner adapted to lift the surface covering against the nozzle lips, a nozzle having rotary surface-agitating lips adapted to contact said surface covering, and actuating means operatively connected to said nozzle lips to rotate said lips relative to said nozzle and to the surface covering.

5. In a suction cleaner, a nozzle having a rotary agitating lip comprising a cylindrical body having positive beaters and means to rotate said lip.

6. In a suction cleaner a nozzle having a rotary agitating lip comprising a cylindrical body having recessed beating elements and means to rotate said body.

7. A suction cleaner comprising a suction nozzle having a depending wall, a rotary agitator mounted closely adjacent said wall in substantially sealed relationship therewith and positioned parallel thereto, the agitator extending below the wall, means to draw a cleaning fluid into said nozzle under said agitator and means to rotate said agitator.

8. A suction cleaner comprising a suction nozzle having a depending wall including a curved lower extremity, a rotary surface-contacting agitator mounted closely adjacent said wall and partly surrounded by said curved extremity thereof and in substantially air sealed relationship therewith, the agitator extending below the said extremity, means to draw a cleaning fluid into said nozzle under said agitator, and means to rotate said agitator.

9. A suction cleaner comprising a nozzle, spaced rotary agitators at the mouth of said nozzle defining the sides thereof, means substantially preventing the leakage of air between said agitators and the walls of said nozzle, and means to rotate said agitators.

10. A suction cleaner comprising a nozzle having spaced sidewalls and rotary agitators defining the nozzle mouth and in substantially air tight relationship with said walls, characterized by the fact that the agitating elements on said agitators are positioned below the periphery thereof.

Signed at North Canton, in the county of Stark, and State of Ohio, this 26th day of November, 1930.

DONALD G. SMELLIE.