

June 4, 1940.

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2,202,999

SUCTION CLEANER

Filed March 3, 1937

2 Sheets-Sheet 1

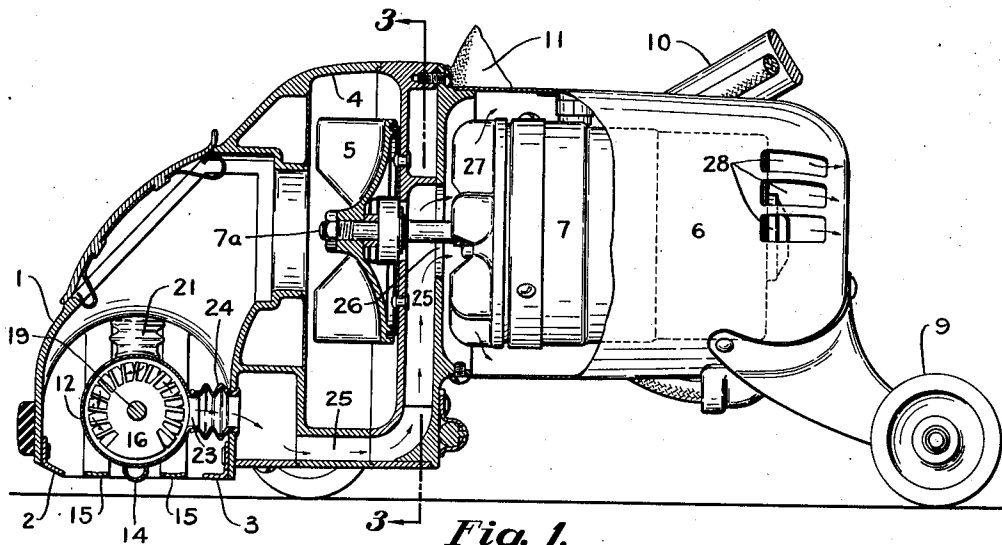


Fig. 1.

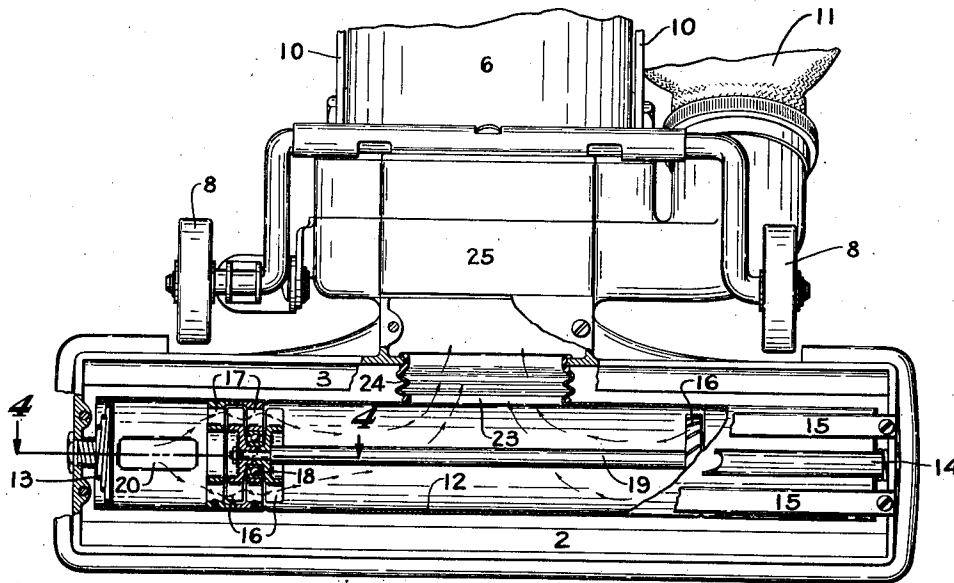


Fig. 2.

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2 Sheets-Sheet 2

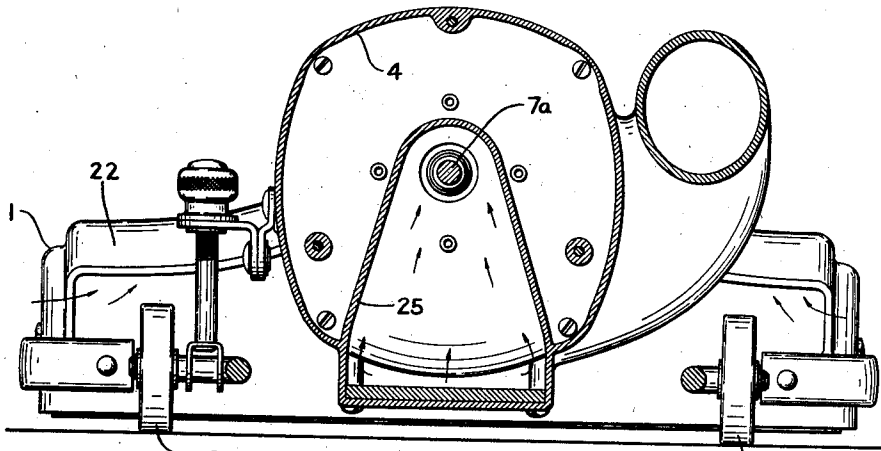


Fig. 3

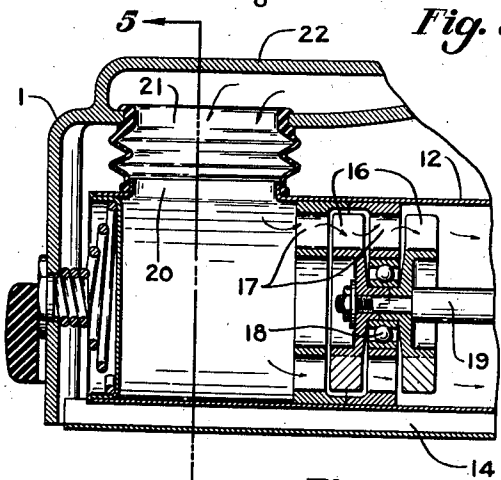


Fig. 4

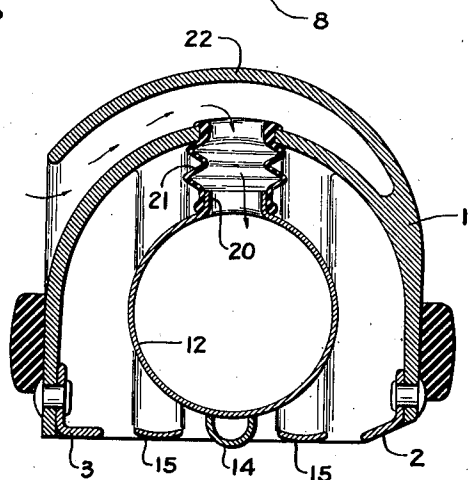


Fig. 5

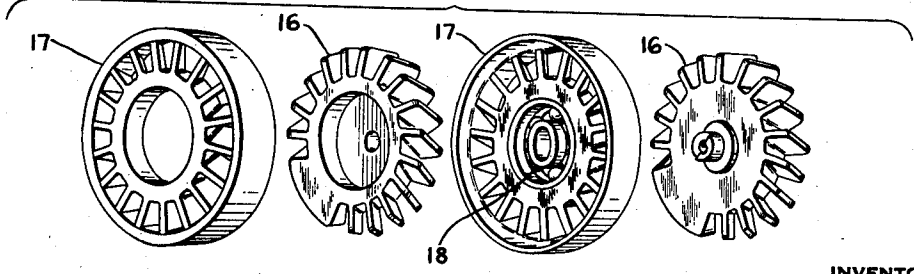


Fig. 6

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SUCTION CLEANER

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Application March 3, 1937, Serial No. 128,745

8 Claims. (Cl. 15—13)

The present invention relates to suction cleaners in general and more particularly to new and improved suction cleaner agitating means. More specifically the invention comprises a suction cleaner including a surface-contacting agitating element which is driven by an air flow created by means other than the usual suction-creating means.

The present invention is related to the invention set forth in applicant's co-pending application Serial No. 531,872, now Patent No. 2,178,003, and is an improvement thereon.

It is an object of the present invention to provide a new and improved suction cleaner. It is another object of the invention to provide a suction cleaner including new and improved agitating means. A still further object of the invention is to provide a suction cleaner including air-driven agitating means which are actuated in a new and novel manner. A still further object of the invention is to provide a new and novel suction cleaner in which a plurality of suction-creating means provide normal nozzle suction and power to drive the surface-agitating means. Still another object of the invention is to provide a suction cleaner in which the surface-contacting agitator is driven by its own suction-creating means. A still further object of the invention is to provide a suction cleaner in which a vibrating agitator is driven by a rotary unbalanced air turbine which is actuated by suction-creating means other than the normal suction-creating means of the cleaner. These and other more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith the attached drawings to which they relate.

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

Figure 1 is a partial longitudinal vertical section through a suction cleaner embodying the present invention and illustrates the agitator-driving turbine and the suction-creating means by which it is driven;

Figure 2 is a partial bottom view of the cleaner shown in Figure 1, certain parts being broken away and shown in section;

Figure 3 is a transverse vertical section upon the line 3—3 of Figure 1 and discloses the air passageway leading to the motor-driven fan in the rear of the normal suction-creating fan;

Figure 4 is a vertical section upon the line 4—4 of Figure 2 and shows the agitator-driving

unbalanced air turbine and its connection to the atmosphere;

Figure 5 is a section upon the line 5—5 of Figure 4;

Figure 6 is an exploded view of one of the air turbines and shows the stationary guide vanes and the unbalanced rotors.

The modern suction cleaner of maximum efficiency includes surface agitating means. These agitating means are commonly driven by power-transmission means which connect them to the rotary driving motor of the cleaner. The primary function of the driving motor is the actuation of the suction-creating means without which no suction cleaner can be complete. The inclusion in the machine of the power-transmission means between the driving motor shaft and the agitating means usually results in undesirable complications and efficiency loss. These power transmission means may take the form of a simple belt or may comprise a gear train with inter-connecting shafts.

The cleaner agitating means can be driven by moving air but to make use of the power of the usual suction-creating fan to actuate the agitator is to reduce the power of the fan which can be directed towards the movement of cleaning air. By the present invention the effectiveness of the normal suction-creating fan to move cleaning air is not affected for a separate air-moving fan is provided for that purpose. In the preferred embodiment of the invention, the air driven and moved by this second fan also performs a motor-cooling function.

Referring now to the drawings in which a preferred embodiment of the invention is disclosed, and in which the same reference character refers to the same part throughout, a modern suction cleaner is disclosed including a nozzle 1 having front and rear surface-contacting lips 2 and 3 respectively. Nozzle 1 is interiorly connected to fan chamber 4 within which is positioned a suction-creating fan 5. At the rear of fan chamber 4 is a motor casing 6 which houses a motor 7 the shaft 7a of which extends into fan chamber 4 where it rotatably carries the suction-creating fan 5. Front supporting wheels 8, 8 and rear wheels 9, 9, movably support the cleaner upon a surface covering undergoing cleaning, the former being pivotally mounted to permit of adjustment to raise and lower the nozzle. As in the usual cleaner a handle 10 is provided by which the operator may propel the machine. The dust bag 11 is suitably connected to the exhaust outlet of fan chamber 4 and may be

carried at its upper end by the handle 10 in a common and well known manner which forms no part of the present invention.

Positioned within nozzle 1 and extended the length thereof is an elongated hollow cylindrical member 12 with closed ends and which comprises the agitator. Agitator 12 is movably supported at each of its ends by a flexible coil spring 13 in such position that the elongated surface-contacting element 14, which is preferably a rigid beater element, extends in surface-contacting relationship to a covering lifted by suction within the nozzle. To prevent excessive pressure in the contact of the covering with the element 14, spacer elements 15, 15 are carried by the nozzle end walls which extend across the nozzle parallel to element 14 and at the sides thereof.

Within agitator 12 are positioned two unbalanced air turbines each of which comprises a pair of unbalanced rotors 16, 16, each rotor including blades. Adjacent to each rotor, and between it and the adjacent end of the agitator, is positioned a stationary set of guide vanes each set bearing the reference character 17. These stationary vanes are sloped in a direction opposite to that of the vanes or blades of the rotors so as to direct air moving toward the center of the agitator into contact with the rotor blades at an angle to effect rotation thereof. These sets of guide vanes 17, 17, are fixedly carried on the inner surface of the body of agitator 12.

The unbalanced rotors 16, 16 of each air turbine are rotatably mounted by a ball bearing 18 and a shaft or spindle 19 extends between the two turbines and inter-connects the rotors so that they rotate as a unit. To insure maximum vibration and the greatest agitation the rotors 16, 16 are so arranged relative to the connecting spindle 19 that they are all unbalanced in the same relationship relative thereto, that is, the center of mass of the rotors lies upon a single line which extends parallel to the shaft.

Agitator 12 is formed with ports 20, 20 at its ends, which ports are connected to the atmosphere through flexible conduits 21, 21 of the accordion type which open through the top wall of the nozzle 1. To enhance the appearance of the cleaner, however, the nozzle 1 is provided with a false top wall 22 which extends over the top of the nozzle proper to provide an air passageway which opens at the rear of the nozzle.

An exit port 23 is provided at the center of agitator 12 which faces toward the rear of the nozzle, and a flexible accordion conduit 24 is connected to a passageway 25 which extends under fan chamber 4 and adjacent the rear wall thereof, the passageway at that point being formed by the rear wall of the fan chamber and the forward wall of the motor casing 6. An opening 26 in the forward wall of motor casing 6 provides an eye for a second suction-creating fan 27 which also is carried by the motor shaft 7a and which is positioned within casing 6, and forward of motor proper 7. The air exhausted by fan 27 passes around the closed motor 7 which is spaced from its enclosing casing 6 and makes its exit to the external atmosphere through ports 28, 28 positioned at the rear end thereof. In passing over motor 7 the air performs a cooling function.

The operation of the cleaner is quite simple. Upon the operator closing the usual motor-controlling switch electric current passes through the driving motor 7 and the motor shaft 7a rotates carrying with it the suction-creating fans 5 and 27. Rotation of fan 5 is effective to create

a reduced pressure within nozzle 1 which in turn causes a surface covering positioned below the nozzle mouth, as defined by nozzle lips 2 and 3, to be lifted upwardly into contact therewith, and also into contact with agitator beating element 14 and spacer elements 15, 15 at the sides thereof. Air is drawn between the lips and the surface covering and passes through the nozzle, through the fan chamber 4, and is exhausted by the fan 5 into the dust bag 11.

The rotation of the suction-creating fan 27 causes a reduced pressure within agitator 12 and air is drawn into the agitator through the end ports 20, 20 passes through the unbalanced air turbines causing the rotors 16, 16 thereof to rotate, and leaves the agitator at its center through the exhaust port 23 and passageway 25 to be drawn by the fan into the motor casing 6 and exhausted therefrom through the rear ports 28. The rotation of the unbalanced rotors 16, 16 causes the agitator body to be vibrated resulting in beater element 14 imparting an agitating effect to the surface covering in contact therewith. This agitation of the surface covering by beater element 14 results in the dislodgment of embedded foreign material which is then removed by the air passing through the nozzle in response to the suction created by fan 5. The air moved by fan 27 functions not only to actuate the unbalanced air turbines but also to cool motor 7 as it passes thereon in passing through the motor casing 6.

I claim:

1. In a suction cleaner, a body including a nozzle, suction-creating means to draw air thru said nozzle, surface-covering agitating means movably mounted on said body in operative relationship to said nozzle, an unbalanced air turbine connected to said agitating means, and second suction-creating means connected to move air relative to said air turbine to actuate the same to vibrate said agitator.

2. In a suction cleaner, a body including a nozzle having lips, suction-creating means to draw air thru said nozzle and under the lips thereof, surface-covering agitating means movably mounted on said body in operative relationship to said nozzle, an unbalanced air turbine connected to said agitating means, second suction-creating means connected to move air relative to said air turbine to actuate the same to vibrate said agitator, a driving motor connected to said suction-creating means, and means to direct the air moved by said second suction-creating means into heat transference relationship with said motor.

3. In a suction cleaner, a body including a nozzle, suction-creating means to draw air thru said nozzle, surface-covering agitating means movably mounted in said nozzle, an unbalanced air turbine in said nozzle connected to said agitating means, air-conducting means enclosing said turbine and connected to atmosphere at one of its ends, and second suction-creating means connected to said air-conducting means and adapted to draw air from atmosphere and past said turbine, said turbine in operation being adapted to vibrate said agitating means.

4. In a suction cleaner, a body including a nozzle, suction-creating means to move cleaning air thru said nozzle, a hollow agitator movably mounted in said nozzle including a surface agitating element and having intake and exhaust ports, an unbalanced air turbine mounted in said agitator between said ports, means connect-

ing said exhaust port to the exterior of said nozzle, second suction-creating means connected to said agitator thru said last-mentioned means and adapted to create a flow of air thru said agitator and turbine to actuate the latter.

5 5. In a suction cleaner, a body including a nozzle, suction-creating means to move cleaning air thru said nozzle, a hollow agitator movably mounted in said nozzle including a surface agitating element and having intake and exhaust ports, flexible conduits connecting said ports to the exterior of said nozzle, said intake port being open to atmosphere, an unbalanced air turbine mounted in said agitator between said ports, second suction-creating means connected to said exhaust port thru one of said flexible conduits and adapted to create a flow of air thru said agitator and turbine to actuate the latter.

10 6. In a suction cleaner, a body including a nozzle, suction-creating means connected to said nozzle adapted to draw cleaning air therethru, a hollow air conduit resiliently mounted in said nozzle, a rotary unbalanced air turbine carried by said conduit, flexible air conducting means connecting said conduit at one side of said turbine to atmosphere, flexible air-conducting means connecting said conduit on the opposite side of said turbine to the exterior of said nozzle, an air passageway extended from said last-mentioned air-conducting means and second suction-creating means connected to said passageway

and adapted to actuate said turbine by moving air therethru.

7. In a suction cleaner, a body including a nozzle, a driving motor having a rotary shaft, a suction-creating fan on said shaft connected to said nozzle to create a reduced pressure therein, a second suction-creating fan on said shaft, a clean air conduit thru said nozzle having a rigid part movably mounted and in communication with said second fan which is adapted to move air therethrough, an unbalanced rotary air turbine mounted in said rigid part, and an agitating element connected to said rigid part and adapted to be moved thereby under the actuation of said turbine.

15 8. In a suction cleaner, a body including a nozzle, a driving motor having a rotary shaft, a suction-creating fan on said shaft connected to said nozzle to create a reduced pressure therein, a second suction-creating fan on said shaft, a clean air conduit thru said nozzle having a rigid part movably mounted and in communication with said second fan, an unbalanced rotary air turbine mounted in said rigid part, an agitating element connected to said rigid part and adapted to be moved thereby under the actuation of said turbine, and means to direct air exhausted by said second fan over said motor to remove heat therefrom.

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