

June 29, 1937.

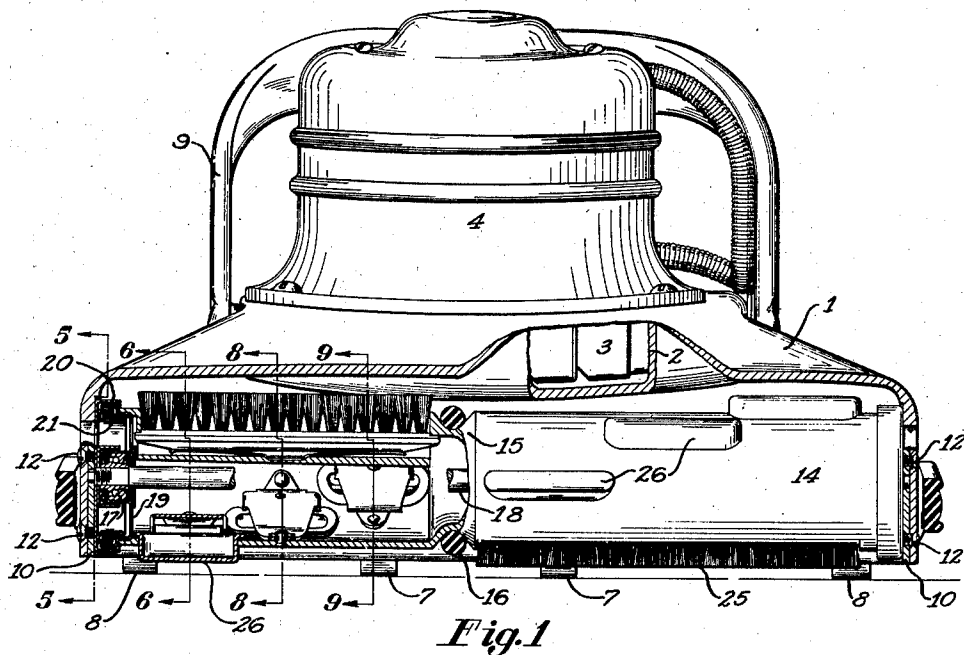
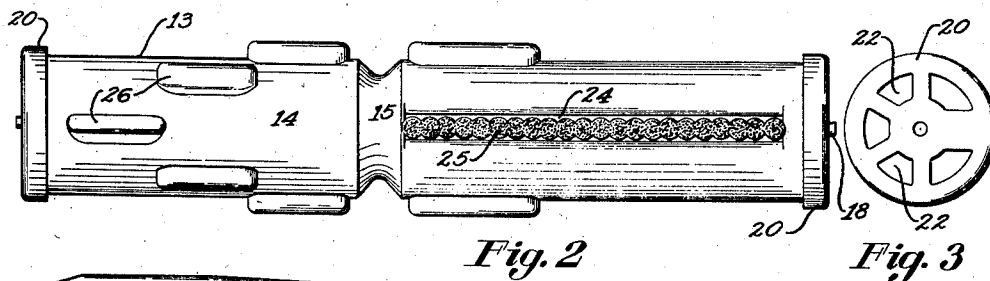
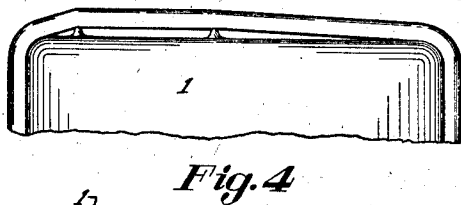
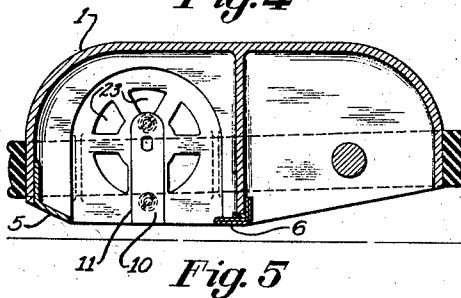
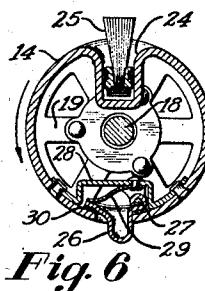
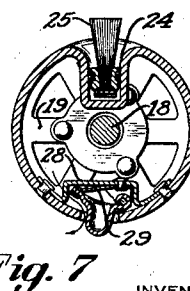
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2,085,700

SUCTION CLEANER

Filed Sept. 25, 1933

2 Sheets-Sheet 1



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SUCTION CLEANER

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2 Sheets-Sheet 2

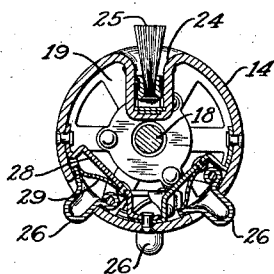


Fig. 8

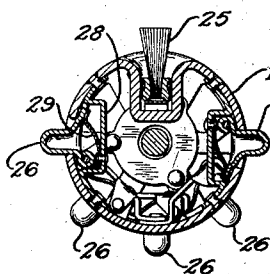


Fig. 9

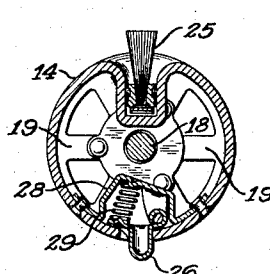


Fig. 10

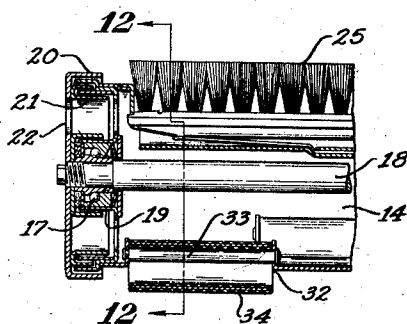


Fig. 11

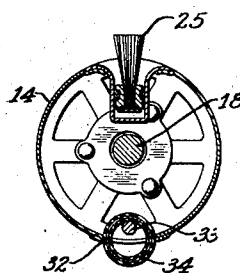


Fig. 12

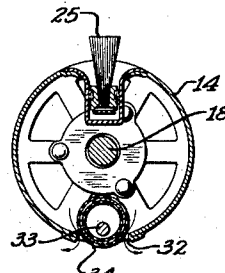


Fig. 13

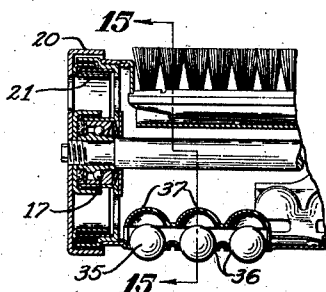


Fig. 14

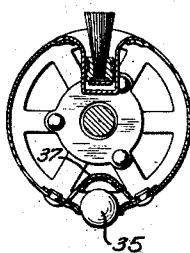


Fig. 15

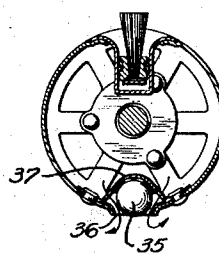


Fig. 16

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2,085,700

SUCTION CLEANER

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Application September 25, 1933, Serial No. 690,801

16 Claims. (Cl. 15—13)

The present invention relates to suction cleaners in general and particularly to an improved rotary agitator construction for a suction cleaner. More specifically the invention comprises a rotary agitator for a suction cleaner which is interiorly connected with the external atmosphere and which is provided with automatic valves which direct cleaning air to the point of surface agitation at the time a positive beating blow is delivered to the covering.

It is an object of the present invention to provide a new and improved suction cleaner agitator. A further object is the provision, in a suction cleaner, of a rotary agitator which is interiorly connected to atmosphere and which includes automatic valves for controlling the flow of cleaning air into the nozzle. A further object is the provision in a suction cleaner of a rotary agitator which is interiorly connected to atmosphere and which includes a movably mounted positive beating element which changes its position at the time of impact to the surface covering to permit the discharge of cleaning air from the agitator to the point of contact with the covering. These and other more specific objects will appear from reading the following specification and claims, and upon considering in connection therewith the attached drawings to which they relate.

In the drawings in which preferred embodiments of the present invention are disclosed:

Figure 1 is a front view of a modern suction cleaner showing a section through the nozzle in which an agitator constructed in accordance with the present invention is embodied;

Figure 2 is a side elevation of a rotary agitator constructed in accordance with the present invention;

Figure 3 is an end view of the agitator shown in Figure 2;

Figure 4 is the top view of the end of the cleaner nozzle;

Figure 5 is a section upon the line 5—5 of Figure 1;

Figure 6 is a section through the agitator being taken upon the line 6—6 of Figure 1;

Figure 7 is a view similar to Figure 6 showing the beater element in the displaced position following its impact with the surface covering undergoing cleaning;

Figure 8 is a section upon the line 8—8 of Figure 1;

Figure 9 is a section upon the line 9—9 of Figure 1;

Figure 10 is a section through a modification

of the agitator in which a different type of spring construction is used;

Figure 11 is a partial longitudinal section through a third preferred embodiment of the invention which makes use of a different type of beating element;

Figure 12 is a section upon the line 12—12 of Figure 11;

Figure 13 is a view similar to Figure 12 with the beating element in the displaced position following its impact with the surface covering;

Figure 14 is a view similar to Figure 11 through a fourth preferred embodiment of the invention;

Figure 15 is a section upon the line 15—15 of Figure 14;

Figure 16 is a view similar to Figure 15 but with the agitating element in its displaced position following its impact with the surface covering.

Maximum suction cleaner efficiency is theoretically obtained when the point of agitation and the point of air cleaning effectiveness are made coincident. In the agitator constructed in accordance with the present invention this desired relationship is produced by a simple mechanism which will be hereinafter fully set forth.

Referring again to the drawings, and Figures 1 to 9 in particular, an agitator constructed in accordance with this invention is shown embodied in a suction cleaner. This cleaner is seen to comprise a nozzle casing 1, a fan casing 2 and a fan 3. The usual driving motor is positioned above the fan casing 2 within the casing 4. The driven fan functions to create a reduced pressure within the nozzle 1 which is effective to lift the surface covering upwardly into contact with the lips 5 and 6. The cleaner is movably supported upon rear wheels 7, 7 and front wheels 8, 8, and a pivoted handle 9 is provided by which the operator can exert a propelling force.

Within the nozzle 1 and removably supported at each end therein by means of a plate 10, which is itself retained in a vertical channel 11 by means of screws 12, 12 is an agitator indicated generally by the reference character 13. This agitator comprises an elongated cylindrical body 14 which is provided substantially mid-way of its length with a portion of reduced diameter 15 which functions as a pulley and seats the driving belt 16 which extends from the lower end of the motor shaft. The cylindrical body 14 is rotatably mounted upon a bearing 17 at each of its ends by a cupped end member 18, the ends of the bearing-carrying shaft 18 being seated in the removable plates 10, 10. To remove the agitator from the nozzle

the screws 12, 12 are removed thereby permitting the plates 10, 10 to slide downwardly in their channels 11, 11 and the body 14 to pass between the lips 5 and 6.

At the ends of the shaft 18 non-rotating end members 20, 20 are provided which overlie the ends of the cylindrical body and the rotating end members 19, 19. Each end member 20 is formed with a circular channel 21 which cooperates with the radially spaced end flanges on the rotating end cup 19 to form a labyrinth to restrict the passage of air. Each end member 20 is provided with apertures 22, 22 which are alined with openings 23, 23 in the end wall of the nozzle. The rotatable end members 19 are similarly apertured so that the interior of the agitator body 14 is connected through the openings to the exterior atmosphere. The labyrinth formed by the end cup and the end plate function as above suggested, to prevent the passage of any appreciable amount of air from the exterior atmosphere into the nozzle around the end of the agitator.

Agitator 13 is provided with a longitudinally extending re-entrant seat 24 in which is removably positioned a brush 25 of a well known type having bristles and a rigid back. To cooperate with the brushes 25, 25 in the removal of foreign matter from the surface covering undergoing cleaning rigid beating elements 26, 26 etc. are provided which extend a distance beyond the normal circumference of the agitator body which is substantially equal to the height of the brush bristles thereabove. In the modifications shown in Figures 1 to 10, inclusive, the agitating elements comprise pivoted rigid metallic members which are rounded at their surface-contacting portions. Each element 26 is pivoted upon a pin 27 carried by a frame 28 within the agitator body. A spring 29 is carried by each frame 28 and contacts a portion of the beater element 26 within the agitator body and functions to retain normally the beater element at its maximum projection beyond the periphery of the agitator body. A resilient cushion, or seal member, 30 overlies the edge of the beater element at its point of contact with the agitator body which functions to prevent chattering and similar noises in the operation of the beater elements and likewise provides an air seal.

In the Figures 1 to 9, inclusive, the spring 29 is shown as a leaf spring, while in Figure 10 the spring is of the coil type.

In the operation of the invention, cleaning air is drawn between the nozzle lips 5 and 6 by the suction-creating means. The surface covering is lifted upwardly into contact with the lips and into contact with the rotating agitator. As the agitator rotates at high speed the beating elements 26 and the flexible brush 25 contact therewith. The brush performs its usual brushing function. The rigid beating elements 26, 26 contact the surface covering and, because of their inertia, and the strength of the holding springs 29 impart a positive beating blow to the surface covering before being themselves deflected inwardly under the reaction of the covering. As the beater element is moved inwardly an opening adjacent thereto is formed in the body of the agitator as the seal 30 moves away from the contact therewith. Through this opening rushes a blast of air downwardly to the exact point of contact of the element 26 with the covering. The air within the agitator is at substantially atmospheric pressure as the interior thereof is connected to atmosphere, as described above. Air con-

tinues to escape to the point of surface contact of the beater element 26 until rotation of the agitator carries that element past the surface covering, thereby permitting the spring 29 to pivot the agitator element outwardly and so close the opening. This functional cooperation results in maximum cleaning effectiveness as air is directed into the surface covering at the point at which the agitating element is beating and deflecting the pile thereof. The direction of agitator rotation is preferably as illustrated in Figure 6 with the blast of air directed largely from the trailing side of the beater element.

Referring now to Figures 11 to 13, inclusive, an agitator similar to that found in the first embodiment is disclosed. In this construction, however, a new type movably mounted rigid beater element is provided. The agitator body 14 is provided with a rectangular opening 32, the metal of the body being extended inwardly at the opposite longitudinal ends thereof and a pin 33, which extends the length of the slot, being carried thereby. Encircling each pin 33 is a cylindrical beater element 34 which is preferably formed with a metallic body for strength which is covered by a rubber covering or coating, both inside and outside, for the purpose of reducing noise. The exterior diameter of cylinder 34 is such that it seats against the sides of the opening 32 when in its outermost radial position and closes that opening, as shown in Figure 12. As shown in Figure 13, when the beater element has been deflected inwardly under the reaction of the surface covering undergoing beating, the opening 32 is open at the sides thereof and air is permitted to escape to the point of agitation, having entered the agitator through the end thereof, as in the first described embodiment.

In the rotation of the agitator centrifugal force holds the beater elements at their maximum radial position, shown in Figure 12, until they have been forced inwardly therefrom by the surface covering contact, as illustrated in Figure 13.

Referring now to Figures 14 to 16, inclusive, a still further preferred embodiment of the invention is disclosed in which the cylindrical beater elements 34 of the last described embodiment have been replaced by balls 35, 35 etc. Openings 36, 36 which are circular, are formed for the beater balls 35 and are of such size that the beaters cannot pass therethrough. The inward movement of each beater is restrained by an overlying cup seat 37 placed opposite the openings 36. Both the seats 37 and the sides of the openings 36 are covered with a resilient insulating material to deaden the sound of the impact of the balls 35 thereagainst, and also to provide a better seal. In operation this embodiment is similar to that last described, and cleaning air passes by a beating ball when that member has been displaced radially inward in the agitator body by its contact with the surface covering.

I claim:

1. In a rotary agitator for a suction cleaner, a rotatable body, a beater element pivotally mounted within said body about an axis located forward of itself in the direction of rotation, said element being extended through said body to a point radially therebeyond, resilient means urging said element radially outward, said element being adapted to move inwardly under a force exerted by a surface covering undergoing cleaning.

2. In a suction cleaner, suction-producing means, a nozzle interiorly connected to said means, a rotatable agitator in said nozzle includ-

ing a body having an air passageway therein connected through said nozzle to atmosphere, a beater element movably mounted relative to said body and rotatable therewith, said body being provided with an opening connecting said air passageway to the interior of said nozzle, said beater element functioning to open and close said opening as it is moved inwardly under the reaction of the surface covering undergoing cleaning and as it is moved radially outward.

3. In a suction cleaner, suction-producing means, a nozzle interiorly connected to said means, a rotatable agitator in said nozzle including a body having an air passageway therein connected through said nozzle to atmosphere, a port in said body connecting said air passageway to the interior of said nozzle, and valve means carried by said body and operable upon the rotation of said agitator in contact with a surface covering to open and close said port.

4. In a suction cleaner, suction-producing means, a nozzle interiorly connected to said means, a rotatable agitator in said nozzle including a body having an air passageway therein connected through said nozzle to atmosphere, a port in said body connecting said air passageway to the interior of said nozzle, valve means for said port, resilient means holding said means in port-closing position, said valve means adapted to contact said surface covering and to be moved thereby to open said port.

5. In a suction cleaner, suction-producing means, a nozzle interiorly connected to said means, a rotatable agitator in said nozzle including a body having an air passageway therein connected through said nozzle to atmosphere, a port in said body connecting said air passageway to the interior of said nozzle, an agitating element positioned in said port and extended radially beyond said body and adapted to contact a surface covering undergoing cleaning, said element being shaped to close said port in one position, means resistingly retaining said element in port-sealing position, said element being adapted to be moved upon contacting a surface covering to open said port.

6. In a suction cleaner, suction-producing means, a nozzle interiorly connected to said means, a rotatable agitator in said nozzle including a body having an air passageway therein connected thru said nozzle to atmosphere, a port in said body connecting said air passageway to the interior of said nozzle, a beater element mounted for movement relative to said body and adapted to be thrown to an outer position by centrifugal force in the rotation of said agitator, said element closing said port in its outer position, said element being adapted to contact a surface covering undergoing cleaning and be moved thereby relative to said body to open said port.

7. In a suction cleaner, suction-producing means, a nozzle interiorly connected to said means, a rotatable agitator in said nozzle including a body having an air passageway therein connected thru said nozzle to atmosphere, a port in said body connecting said air passageway to the interior of said nozzle, a beater element

mounted for movement relative to said body and shaped to seat in and close said port in one position, the relationship between said body and said element being such that said element is held in port-closing position by centrifugal force in the rotation of said agitator, said element being adapted to contact a surface covering and be deflected thereby to open said port.

8. The construction defined by claim 7 characterized by the fact that said beater element is a cylindrical member.

9. The construction defined by claim 7 characterized by the fact that said beater element is a hollow cylinder and the further fact that movement-limiting means extend thereinto.

10. The construction defined by claim 7 characterized by the fact that said beater element is a metal cylinder provided on its surface with a sound-deadening material.

11. The construction defined by claim 7 characterized by the fact that said beater element is a metallic ball.

12. The construction defined by claim 7 characterized by the fact that said beater element is a metallic ball and the further fact that surfaces of said body with which said element contacts are protected by a sound-deadening material.

13. In a rotary agitator for a suction cleaner, a rotatable body, a beater element, means pivotally mounting said element relative to said body for movement in a path having an inward radial component with said element in its surface-contacting position, means limiting the outward radial movement of said element, and resilient means opposing the pivotal movement of said element under a force exerted by a surface covering undergoing cleaning.

14. The construction recited in the preceding claim characterized in that said means limiting the outward radial movement of said element includes sound-deadening means to reduce the noise of operation.

15. In a rotary agitator for suction cleaners, a rotatable body, and a beating element pivotally mounted on said body about an axis displaced circumferentially, that is to one side of, a plane through the axis of rotation of said body and the point of substantial covering contact of said element, said element being adapted to be deflected about its pivotal axis by contact with a surface covering and being subjected to centrifugal force to return it to its original position after such contact.

16. In a suction cleaner, suction-producing means, a nozzle interiorly connected to said means, a surface covering agitator movable in a path subjecting certain of its parts to centrifugal force, said agitator including a body having an air passageway therein connected through said nozzle to atmosphere, a port in said body connecting said air passageway to the interior of said nozzle, and valve means carried by said body and operable upon the movement of said agitator in contact with a surface covering to open and close said port.

WILLIAM H. KITTO.