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1,952,999

SUCTION CLEANER

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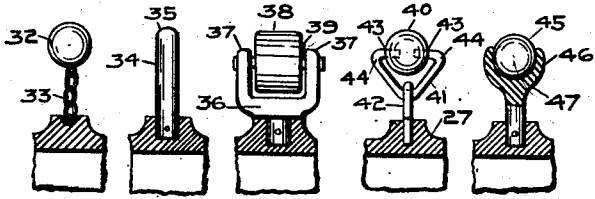
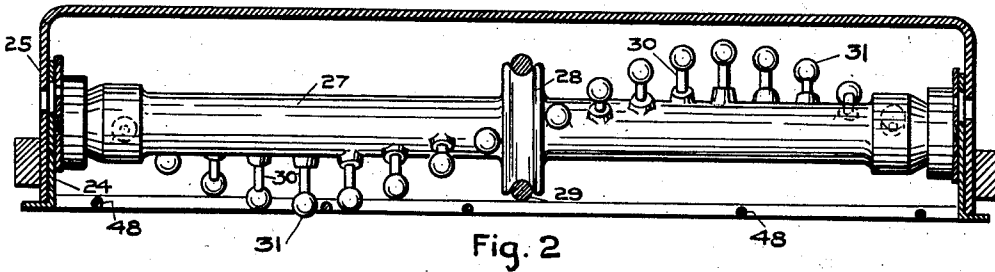
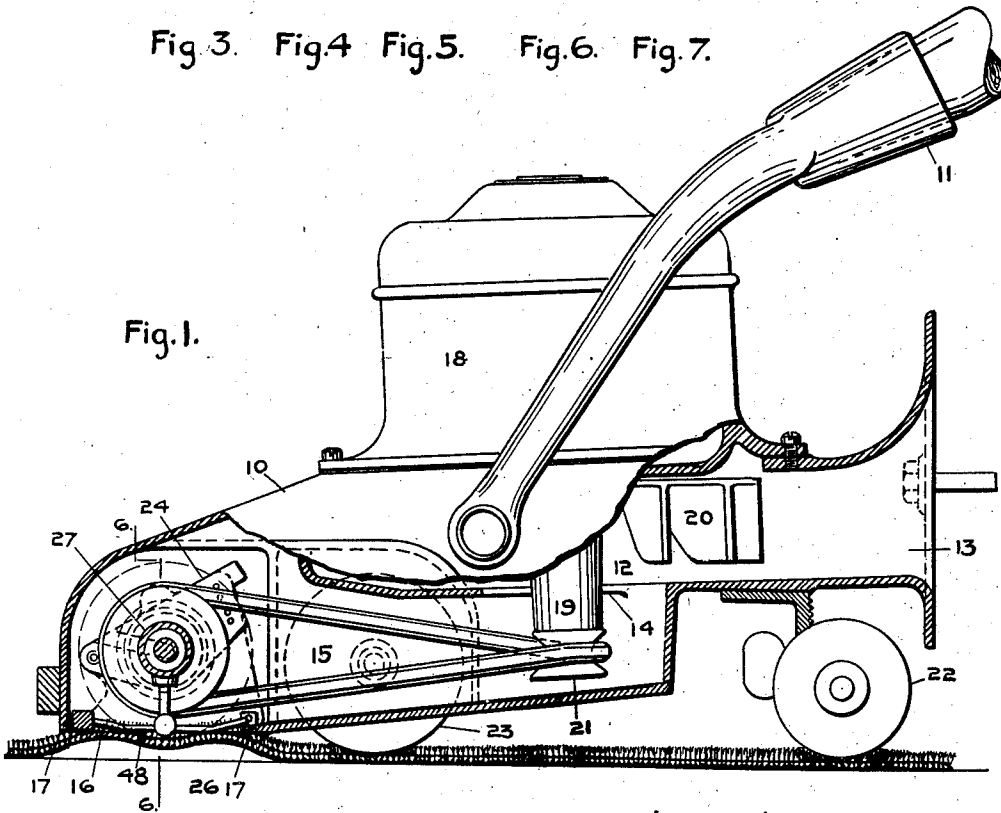


Fig. 3. Fig. 4. Fig. 5. Fig. 6. Fig. 7.



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UNITED STATES PATENT OFFICE

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SUCTION CLEANER

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5 Claims. (Cl. 15--13)

My invention relates to means for extracting dust and other foreign material from floor-coverings or the like by a rapidly-moving current of air acting in combination with a series of beaters which strike and cause the floor-covering to vibrate and thus dislodge the dust and dirt imbedded in it; the air current acting to convey away the dirt and dust dislodged.

An essential object of my invention is the combination of means whereby the object being cleaned is held suspended across a suction opening by the pressure difference creating the air current, with a rotor driven at a relatively-high rate of speed and provided with elements so mounted and arranged as to deliver relatively-powerful positive blows to the object being cleaned, tending to drive it away from the opening against the action of the air pressure, which returns it to position for the next succeeding blow.

Another object of my invention is the provision of a combination of a suction-cleaner having a suction-mouth so arranged that the object to be cleaned will be raised and held suspended across the mouth of the suction with a series of beaters having a fixed orbit of travel which intersects the surface assumed by the floor covering under the action of suction. Due to its inertia, the dust and dirt tend to remain stationary while the floor covering or other object being cleaned is vibrated. This allows the current of air to pick up the dirt so dislodged and convey it away to a suitable collecting receptacle. In the use of my invention a rapidly progressive succession of powerful, positive and evenly distributed blows are delivered to the floor covering which is thus agitated and vibrated while drawn into suspended contact with the suction mouth as the cleaner is moved forwardly and backwardly. There is also a tendency to force the floor covering slightly out of sealed contact with the suction mouth adjacent the point struck by each blow, for the admission of air at that point, thus permitting the loosened dirt to be readily removed by suction. My invention minimizes carpet wear, load on the motor and noise in operation. It enables the use of a small motor with excellent results, and secures a substantially uniform air flow as well as accomplishing many other advantageous results.

Other objects of my invention will appear more fully from the description following and from the claims appended hereto.

I have illustrated my invention in a variety of forms in the accompanying drawing wherein—

Figure 1 is a cross-section through the suction-chamber and associated parts of a cleaner constructed in accordance with my invention;

Figure 2 is a longitudinal section on line 6—6 of Figure 1 with the beating-rotor shown in elevation; and

Figures 3 to 7 inclusive illustrate in detail a variety of modified beater forms.

Throughout the specification like reference characters are used to indicate like parts.

I have incorporated my invention in a suction-cleaner formed of an aluminum casting 10 to which is pivotally secured a handle 11. In this casting 10 is formed a fan-chamber 12 having an outlet 13 adapted to receive a dust-collecting bag (not shown) and an inlet-opening 14 which connects with a suction-chamber 15 extending to the front of the casting and formed with a downwardly-facing suction-mouth 16 provided with lips 17.

On the casting 10 is mounted an electric-motor 18, the shaft 19 of which carries the fan-rotor 20 and the pulley 21, the latter being positioned in the rear of the suction-chamber. The rear of the casting is supported by means of the vertically-adjustable wheel 22 and the front by means of rotatably-mounted carrier-wheels 23 positioned one at each side of the casting and to the rear of the suction-mouth in such a manner as not to prevent the object being cleaned from being raised freely to the suction-mouth.

Directly above the open mouth of the suction-chamber, adjustable rotor supports 24 are mounted on the end-wall 25. These supports in turn carry a shaft 26 upon which is rotatably mounted the hollow tube 27 forming the body of the beating-rotor. This rotor-body is provided intermediate its ends with a pulley 28 which is connected to the pulley 21 on the motor-shaft by means of the belt 29 which is given a 90° turn.

In the embodiment of my invention illustrated by Figures 1 and 2, I have shown the rotor-body provided with a single helical row of beaters each composed of a rigid pin 30 firmly fixed in the rotor-body and extending in a radial direction. On the free end of each pin is securely mounted a ball 31 which forms the striking head. These balls are preferably composed of a hard smooth material which will slide over the common types of floor coverings with a minimum of friction and which will not rust or corrode or in any manner stain the floor coverings acted upon.

In Figures 3 to 7 inclusive, I have illustrated a series of alternate forms of beater elements that may be mounted upon the rotor-body 27. Figure

3 illustrates a form in which the ball 32 is attached to one end of a flexible chain 33, the other end of which is anchored to the rotor-body 27. This form of beater element when rotating at the high speed customary in this type of suction-cleaners, due to the action of centrifugal force, approximates the action of a rigid beater and for all practical purposes may be considered as having a fixed orbit of travel.

Figure 4 illustrates a form of beater-element consisting of a rigid-pin 34 firmly secured to the rotor-body 27 and provided with a rounded end 35 which acts as the beater head.

Figure 5 shows a modification consisting of a forked bracket 36 having arms 37, 37, between which a roller 38 is rotatably mounted on a pin 39 secured in the arms 37, 37.

Figure 6 shows a modification in which the beating head consists of a ball 40 rotatably mounted on a triangularly-shaped link 41 which is pivotally secured to an eye-member 42, mounted on the rotor-body 27. The ball 40 is formed with diametrically-opposed depressions 43, 43, which receive the ends 44, 44, of the triangular-link 41.

Figure 7 illustrates a modification consisting of a ball 45 acting as a beater-head which is rotatably mounted in the cup-shaped end 46 of the pin 47.

In each of the modifications illustrated by Figures 5, 6, and 7, it will be noted that the beating head is so arranged that it may rotate and thus have a rolling contact with the floor-covering it is acting upon. This arrangement is advantageous in that it minimizes the friction between the beater head and the floor-covering and, accordingly, the wear on said floor-covering.

As shown in Figures 1 and 2, I have placed across the open suction-mouth of the casing 10, a series of guard fingers 48, secured to the front lips of the suction mouth. These guard-fingers not only prevent the picking up of large objects that might be detrimental to the machine, but also limit the extent to which the floor-covering being cleaned is drawn into the suction-mouth under the influence of the suction and thus prevents any undue braking action on the rotating beating elements. The guard-fingers further determine the shape that the object being cleaned will assume under the action of the suction and, as shown, are all made of the same shape so that the action of the beating-elements will be uniform from one end of the suction-mouth to the other.

I desire particularly to point out that when using beating elements having a fixed or substantially fixed orbit of travel, it is absolutely essential that the object being cleaned be raised from the floor and be able to vibrate freely, since the hammering action which would ensue were the object rigidly supported, would be exceedingly injurious both to the object being cleaned and to the machine.

I claim:

1. In a suction cleaner, a casing provided with a suction mouth, means supporting the casing with the plane of the suction mouth a substantial distance above the plane normally occupied by the object to be cleaned, a series of spaced apart guard fingers carried by the casing and extending across the suction mouth, means for moving a current of air past the object to be cleaned and through the casing so as to lift said object and suspend it against said fingers, a member rotatably mounted in the casing and

provided with rigid beater members having curved surfaces positioned to contact with said object, the beaters being helically mounted on the rotatable member and arranged in a series extending from one end of said rotatable member to the other, said beaters being rigidly secured to the rotatable member and having orbits of travel extending below the plane occupied by the object to be cleaned while suspended against said fingers, but not extending to the plane in which said object normally rests when not suspended, and means rotating the rotatable member.

2. A suction cleaner comprising a casing provided with a downwardly facing suction mouth, means for supporting the casing upon the surface of an object to be cleaned, with the suction mouth a substantial distance above the normal plane of said surface, a series of guard fingers carried by the casing and extending across the suction mouth in substantially the same plane, means for moving a current of air past the object to be cleaned and through the casing so as to lift a portion of said article and suspend it against said guard fingers and the suction mouth, a member rotatably mounted in said casing and provided with a series of rigidly mounted beater elements extending through the spaces between adjacent guard fingers and below the plane defined by them, but not to the plane normally occupied by the object to be cleaned when not suspended, and means for rotating the member.

3. A suction cleaner comprising a suction creating device, a prime mover operatively connected to said suction creating device, a suction chamber connected with said suction creating device and having a suction mouth supported a substantial distance above the plane normally occupied by the object to be cleaned and in approximate parallelism thereto, a rotatable member mounted in said suction mouth and operatively connected with said prime mover, said rotatable member being provided with rigid projections arranged at an angle to the axis of said rotatable member, each projection being of a length to cause it to extend from said rotatable member a sufficient distance to allow the free ends thereof while in their lower-most positions to project below the plane defined by the suction mouth, but shorter in length than the distance between said rotatable member and the plane in which the object to be cleaned normally rests.

4. A suction cleaner comprising a casing provided with a suction mouth, means for supporting the casing upon the surface of a flexible fabric with the suction mouth a substantial distance above the normal plane of said surface, means for moving a current of air past the fabric and through the casing so as to lift and suspend that portion of said fabric immediately beneath the mouth in contact with its lips as the machine is moved backwardly and forwardly, a rotor mounted in said casing adjacent the suction mouth, rigid projections on the periphery of said rotor disposed in the form of a helix, said projections adapted to project slightly below the suction mouth but not to the plane normally occupied by the fabric when not suspended, and means for rotating said rotor, whereby the fabric is constantly given a rapid succession of positive evenly distributed blows throughout substantially the length of the mouth of the cleaner as it is moved forwardly and backwardly, thereby beating and positively agitating the fabric, and at the same time forcing it slightly out of sealed

contact with the lips, adjacent each point successively struck, to admit an increased amount of air and enable the dirt vibrated to the surface to be removed by the current of air.

it is suspended by suction against said mouth, but not extending to the plane in which the fabric normally rests while not so suspended, so that during the rotation of the shaft the fabric is positively agitated, by a series of progressive blows throughout a width corresponding substantially to the length of the suction mouth, while it is maintained by suction in suspended contact with the mouth, and the fabric is also forced slightly out of sealed contact with the mouth progressively across it, whereby air is admitted immediately adjacent that portion of the fabric which is engaged by the beater members to enable the dirt vibrated to the surface to be carried away by suction.

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5 5. In a suction cleaner, a casing provided with a suction mouth, means for maintaining the mouth above and out of contact with a flexible fabric while the cleaner is out of operation, means for creating suction through said mouth, a rotary shaft mounted within the casing above the mouth opening, means whereby the shaft is driven, smooth-surfaced rigid beater members secured to the rotary shaft and helically arranged approximately from one end of the shaft to the other, and having orbits of travel extending below the highest horizontal plane occupied by that portion of the fabric being cleaned, while

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