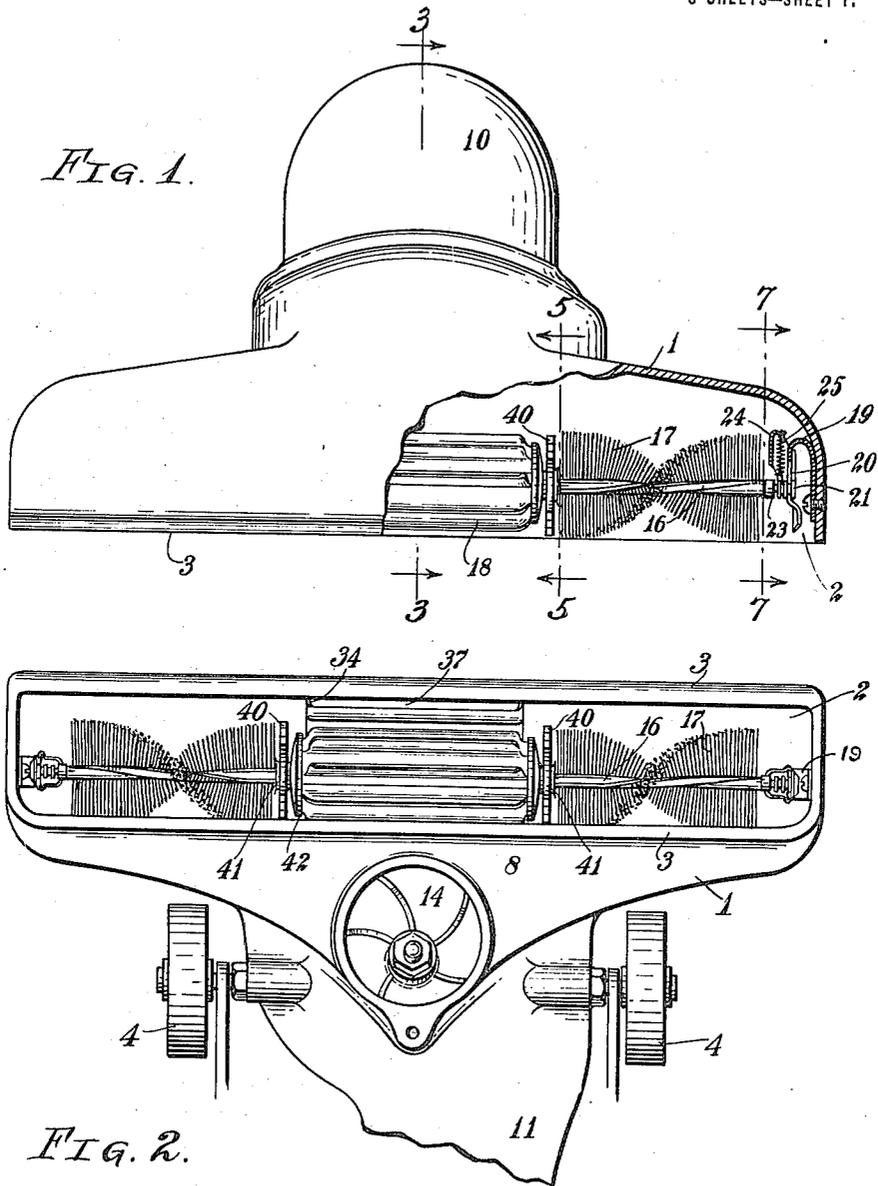


J. B. KIRBY,
 VACUUM CLEANING MACHINE.
 APPLICATION FILED MAR. 28, 1914.

1,209,722.

Patented Dec. 26, 1916.

3 SHEETS—SHEET 1.



Witnesses:

A. L. Lord.
 R. L. Bruck.

Inventor.

James B. Kirby
 BY Hull & Smith Att'ys.

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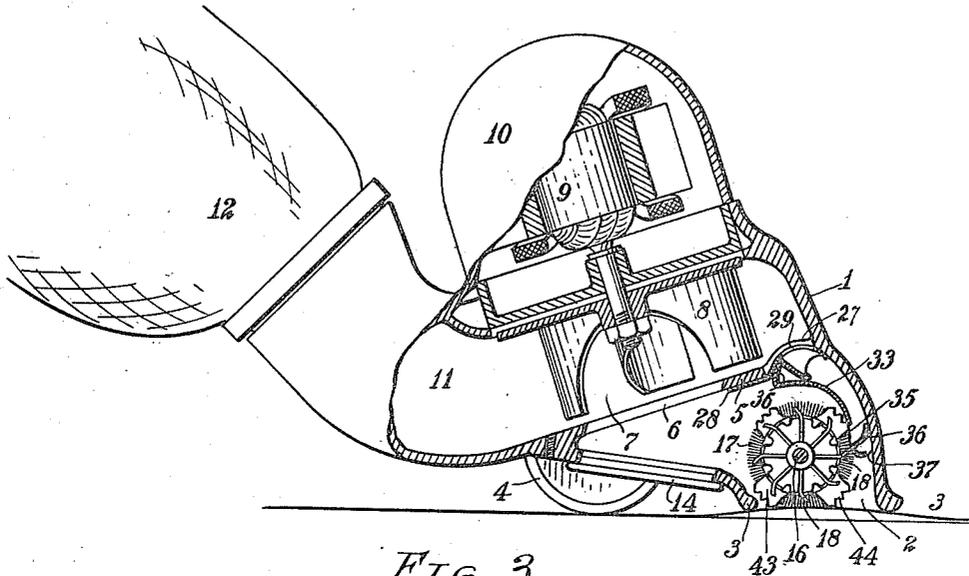


FIG. 3.

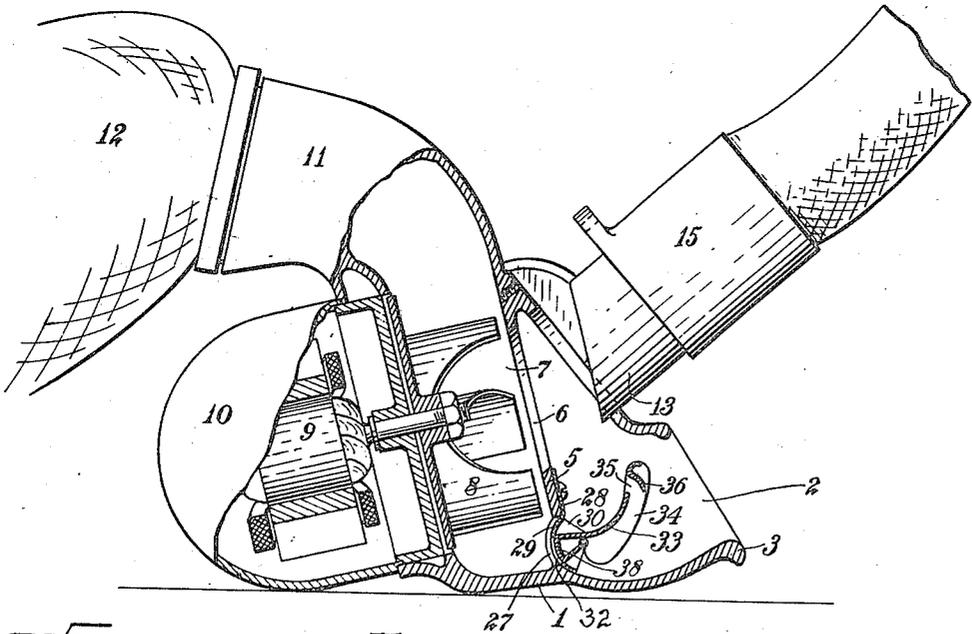


FIG. 4.

Witnesses:
 U. L. Lord
 R. L. Bruck

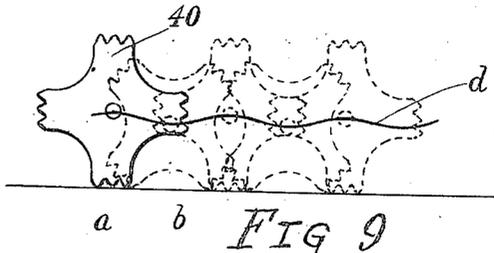
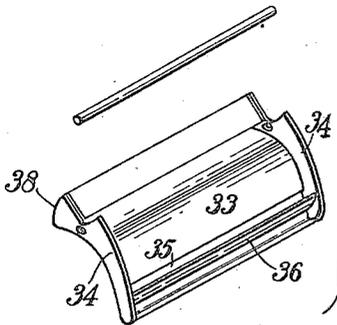
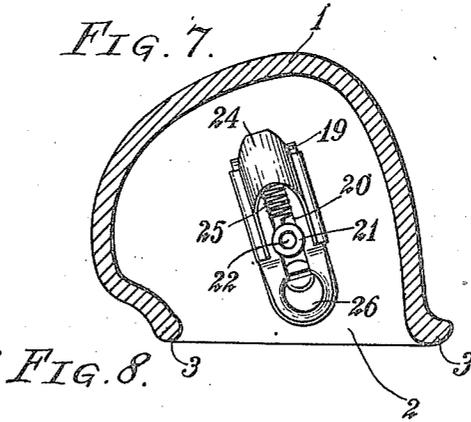
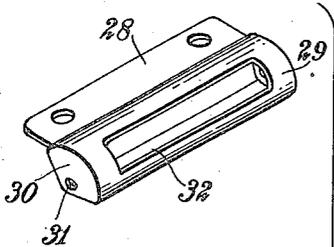
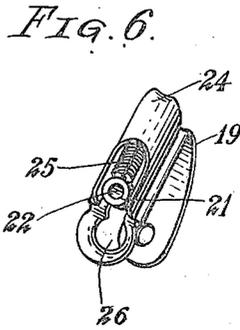
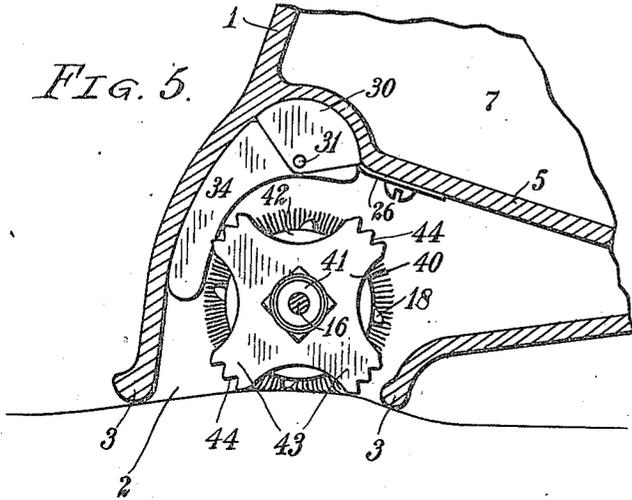
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3 SHEETS—SHEET 3.



Witnesses:

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UNITED STATES PATENT OFFICE.

JAMES B. KIRBY, OF CLEVELAND, OHIO.

VACUUM CLEANING-MACHINE.

1,209,722.

Specification of Letters Patent.

Patented Dec. 26, 1916.

Application filed March 28, 1914. Serial No. 327,785.

To all whom it may concern:

Be it known that I, JAMES B. KIRBY, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Vacuum Cleaning-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to vacuum cleaning machines and has for its objects the provision of a device of this character which will clean rugs, carpets, and other floor coverings with great rapidity and efficiency and without damage to the same in case the machine should be used carelessly or heedlessly.

More specifically the present invention contemplates an improvement upon that described and claimed in my prior application filed November 15, 1913, Serial No. 801,125, in which I disclosed for the first time the operation, by means of an air motor or like contrivance connected to the high pressure side of the fan, of sweeping, brushing, beating, or other agitating devices located within the inlet mouth of the apparatus and arranged to operate upon the rugs, carpets, or other fabrics with which the device should be used.

Experience has shown that a sweeping or brushing device located within the inlet mouth of the apparatus and operated by the air pressure can be operated efficiently only in case it be very delicately balanced or else be supplied with a very powerful turbine; in case the brushes shall rest upon the floor with slightly too much force, it will be found impossible to operate them except with a turbine of such size as to detract seriously from the efficiency of the cleaner, while if they be suspended so as to engage the floor with the smallest force at which they will be effective in picking up strings, lint, etc., a very small accident to the adjustment will render them ineffective. Also in case the brushing device should be so nicely balanced within the shoe as to operate satisfactorily and also develop a proper brushing effect, the shoe must necessarily be kept in constant motion since a stoppage of the shoe at any point for more than a very brief interval will result in such a wearing effect upon the nap of the floor covering as to give rise to a noticeable mark.

The objects of the present invention are,

therefore, the provision of a new and improved construction of brushing mechanism; the provision of new and simplified means for mounting the same within the shoe; the provision of means for preventing the operation of the brushing mechanism while the shoe is stationary and permitting the same while the shoe is moving; the provision of a new and improved construction of air conduit, whereby the motor duct can be conveniently closed in case the brushing device is not desired; while further objects and advantages will appear as the description proceeds.

Generally speaking my invention may be defined as consisting of the combinations and constructions recited in the claims hereto annexed and illustrated in the drawings accompanying and forming a part of this application, wherein:

Figure 1 is a front elevational view of a vacuum cleaner head containing my improvement, a portion of said head being broken away and a portion of one of the bearings being shown in cross section; Fig. 2 is a bottom plan view of the devices shown in Fig. 1; Fig. 3 is a vertical cross-sectional view taken through the center of the head upon the line 3—3 of Fig. 1 and looking in the direction of the arrows; Fig. 4 illustrates the same head reversed for the attachment of a hose connection, the main part being shown in cross section and the air slots being closed; Fig. 5 is a detail view taken upon the line 5—5 of Fig. 1 and looking in the direction of the arrows; Fig. 6 is a perspective view of one of the brush bearings; Fig. 7 is a detail view taken upon the line 7—7 of Fig. 1 and looking in the direction of the arrows; Fig. 8 is a separated perspective view of the parts comprising the air duct; and Fig. 9 is a diagrammatic view showing the different positions assumed by the brush during the progress of the cleaner across the floor.

Describing the parts by reference characters, 1 indicates the cleaner casing, generally of metal, and having a downwardly opening laterally elongated suction mouth defined by spaced, substantially parallel lips 3—3, which lips are maintained substantially parallel with the floor and at about the same height thereabove by means of suitable wheels or rollers 4—4 as will be well understood by those skilled in the art. This casing will hereinafter be termed the shoe,

though without any intention to circumscribe either the construction, design, or arrangement of the same. Traversing the interior of this shoe between the upper and lower portions thereof is a substantially flat septum 5 formed with an aperture 6, and defining a fan chamber 7 in which is rotatably mounted a centrifugal fan 8 adapted to be operated by the electric motor 9 concealed within the casing 10 carried by the shoe. At its rearward portion the shoe is extended to form a discharge beak 11 which communicates with a suitable bag or like receptacle 12 whereby the dust and dirt are retained and the air is discharged. The aperture 6 communicates freely with the inlet mouth 2, but is preferably located to the rearward thereof as shown in Figs. 3 and 4, and the wall of the shoe opposite this aperture is formed with an opening 13 which is ordinarily closed by a cover 14 so as to permit the attachment of a hose connection 15 in case it be desired to clean curtains, draperies, clothing, books, or the like.

Inasmuch as the construction so far described is common in the art, I have shown the parts merely conventionally and have referred thereto for purposes of clearness in connection with the part to follow.

The location of the apertures 6 and 13 at one side of the mouth 2 permits said mouth to be made substantially straight as illustrated in Fig. 2, and in this mouth I support a rotatable brushing device consisting of a shaft 16 having bristles or other brushing devices 17 secured thereto, and also, in the present embodiment, having air vanes 18 secured directly thereto and arranged to operate the same. The bearings for the said shaft are preferably of a peculiar design, permitting the shaft to be yieldingly supported so that only a fraction of its weight may rest upon the floor and so that the brush will yield in case it comes in contact with any obstruction, while also permitting ready removal and replacement of the brush for cleaning purposes. Preferably each of these bearings consists of a U-shaped member 19 of spring metal, one of the arms of the U being arranged for attachment to the end wall of the shoe (see Figs. 1 and 6) and the other arm being formed with an elongated longitudinal slot 20 which slidingly receives a button 21, the face whereof is recessed as at 22 for the reception of the pointed end 23 of the shaft 16. Also secured to the free arm of the member 19 is a clip 24 in which is secured a spiral spring 25, whose lower end is attached to the button 21. The strength of this spring is such as to permit only a fraction of the weight of the brush to rest upon the floor, and the spring is shielded against injury by the clip 24. At the point farthest from the point of

attachment of the spring 25 the slot 20 is enlarged as at 26 to permit the removal of the button in case of necessity. For the removal of the brush, however, it is necessary merely to bring together the arms of the member 19, whereupon the shaft 16 can be readily removed.

Formed in the forward edge of the septum 5 immediately above the vanes 18, is an aperture 27 which communicates with the fan chamber at a point outside of the periphery of the fan and substantially opposite the discharge beak 11. Through this aperture is derived the air necessary to the operation of the brushing devices, and the construction of the conduit which I prefer to employ is as follows: Secured to the lower face of the septum 5 adjacent to this aperture is a metal plate 28 having at one side a cylindrical portion 29 the ends of which are folded up as at 30 and formed with apertures 31 coaxial with the cylinder surface. The face of the cylindrical portion 29 is formed with a slot 32 adapted to register with the opening 27. Pivoted between the ends 30—30 is a second plate 33 which is curved so as to avoid the vanes 18 and still remain spaced from the inner wall of the mouth. The ends of the plate 33 are turned inwardly as at 34—34 so as to form with the wall of the mouth a closed passageway, and the plate itself at a point near its free edge is formed with a slot 35 running substantially from end to end thereof, the metal displaced in the making of the slot being preferably bent inwardly as at 36 so as substantially to engage the inner wall of the mouth and deflect the air passing behind the plate directly upon the vanes 18. The free edge of the plate is preferably spaced from the wall of the shoe a short distance as shown at 37 so as to permit the insertion of a tool for prying the plate away and revolving it around its pivot, while the portion of the plate at the opposite side of its pivot from the slot 35 is preferably formed upon the arc of a circle concentric with this pivot as shown at 38 and arranged to close the slot 32 when the plate is moved in the position shown in Fig. 4. It will be seen that this can be done only in case the brush be removed, but this is no hardship from the fact that it becomes necessary to close this slot only in case the machine is to be used with the hose connection, and while so used the brush becomes inoperative.

Surrounding the shaft 16 and easily rotatable with respect thereto are a plurality of non-circular washers 40—40 which may be of metal, fiber, hard rubber, celluloid, pasteboard, or any suitable material. In the present embodiment these washers are two in number and are swiveled upon the enlarged

hubs 41 of circular disks 42 which form the ends of the air turbine. The ends of these hubs are flanged slightly as shown in Figs. 1 and 2 so as to hold the washers in place, and the apertures in the washers are preferably made square so as to afford enough flexibility to their edges to enable their removal and replacement. This permits the washer to be sprung on and off with ease, and with a flexible brush the same can be entirely removed if desired. In the present embodiment each of the said washers is provided with four equidistantly spaced arms 43—43, the ends of which are preferably serrated as at 44. The length of these arms is slightly greater than the length of the bristles 17, and the spread of the arms is such that a line touching two adjacent arms will approach the shaft 16 a distance considerably less than the length of the bristles. The strength of the springs 25—25 is so adjusted that the weight of the brush is largely supported, leaving sufficient pressure upon the floor so that when the washers are in the position illustrated at *b* in Fig. 9 (as will occur at every instant that the shoe is at rest), the engagement of the bristles with the floor or floor covering will prevent the rotation of the brush by the turbine. However upon the movement of the shoe in either direction, the serrations 44 will catch in the floor covering and rotate the washers into the position shown in Fig. 9 at *a*, whereupon the brush will instantly begin to rotate with great rapidity. Of course as the shoe is moved across the floor the washers 40—40 continue to revolve, the successive positions of their centers forming a wavy or undulating line as indicated at *d* in Fig. 9, and the movement of the shaft 16 and brush 17, instead of being one of continuous regular rotation is one of intermittent rotation or of sudden jumps and stops, but the cleaning effect of the brush does not seem to be impeded, and particles of lint, thread, dressmaker's scraps, toothpicks, and other things found upon floors are picked up with great ease.

While I have necessarily described my invention in detail it will be apparent that many changes in construction, arrangement, and design of parts could be made without departing from my inventive idea, wherefore I do not restrict myself to the details described except as the same may be specifically recited in the claims hereto annexed or may be rendered necessary by the prior state of the art.

Having thus described my invention, what I claim is:—

1. In a device of the character described, a shoe adapted to be moved about the floor, an agitating device carried by said shoe and adapted to operate upon the floor, a power source carried by said shoe and operatively

connected to said agitating device, the operation of said power source being independent of the motion of said shoe, and means for preventing the driving of said agitating device by said power source when said shoe is at rest.

2. In a suction cleaner, a shoe having an inlet mouth adapted to be moved about over the floor, an agitating device located within said mouth and adapted to operate upon the floor, a power source carried by said shoe, a non-positive power transmitting device operatively connecting said power source with said agitating device, and means actuated by the movement of said shoe along the floor for alternately permitting and preventing the operation of said agitating device.

3. A vacuum cleaning machine, comprising a fan chamber and a fan therein, a shoe having an exhaust passage opening into the low pressure region of said fan chamber and also having an air passage opening into the high pressure region of said fan chamber, agitating devices carried by said shoe and arranged to be operated by the air passing through said last named passage, and means associated with said agitating devices for preventing the operation of the same except when said shoe is in motion.

4. In a device of the character described, the combination, with a supporting casing arranged to be drawn across the floor, a continuously operating power source carried by said casing and a brushing device carried by said casing and arranged to operate upon said floor, of impositive power transmitting devices connecting said power source and said brushing device, and means operative during a uniform movement of said casing for driving said brushing device intermittently.

5. In a vacuum cleaning machine, the combination, with a shoe, a power operated suction fan in said shoe, a collecting mouth communicating with said fan, a brushing device in said mouth, and means operated by power derived from said fan for driving said brushing device, of means operative during the movement of said shoe across the floor for moving said brushing device alternately nearer to and farther from the floor, said brush being held immovable at the time of its nearest approach to the floor.

6. In a vacuum cleaning machine, in combination a shoe, a power operated suction fan in said shoe, a collecting mouth communicating with said fan, a brushing device in said mouth adapted to be rotated when located at one point in said shoe and to be held stationary when located at another point in said shoe, means operated by power derived from said fan for driving said brushing device, and floor engaging means associated with said brushing devices to

normally maintain the same in its stationary position, and to shift said brushing devices to operating position momentarily during the movement of said shoe and to restore it to stationary position upon the cessation of movement of said shoe.

7. In a vacuum cleaning machine, the combination, with a shoe having a suction mouth and a fan chamber communicating therewith, a suction fan in said chamber, a brush in said mouth and an air turbine operated by air derived from said fan for operating said brush, of a loose washer sleeved upon the brush axis at each side of its center, each washer comprising a plurality of radiating, floor-engaging arms, the length of said arms being slightly greater than the brush diameter and the spread of said arms being such that a line touching two adjacent arms will approach the brush axis a distance materially less than the brush radius.

8. In a vacuum cleaning machine, the combination with a shoe having a fan chamber and a downwardly opening mouth communicating with the low pressure region of said fan chamber, of a pivot button yieldingly supported at each end of said mouth and arranged for movement in a vertical direction, a shaft journaled in said buttons, an air turbine connected to said shaft, an air conduit connected to the high pressure region of said fan chamber and arranged to deliver air against the turbine blades, and agitating devices carried by said shaft.

9. In a vacuum cleaning machine, the combination with a shoe having a fan chamber and a downwardly opening mouth communicating with the low pressure region of said fan chamber, of a flexible leaf spring secured at each end of said shoe inside said mouth and yieldable in a direction away from the other spring, each of said springs having a substantially vertical elongated slot formed therein, a pivot button slidably mounted in each slot, a brush shaft journaled in each button, a helical spring connected to each button and tending to raise said shaft, and means including an air turbine for rotating said shaft.

10. In a vacuum cleaning machine, the combination with a shoe having a fan chamber and a downwardly opening mouth communicating with the low pressure region of said fan chamber, of a flexible leaf spring secured at each end of said shoe inside said mouth and yieldable in a direction away from the other spring, each of said springs

having a substantially vertical elongated slot formed therein, a pivot button slidably mounted in each slot, a brush shaft journaled in each button, a clip secured to each leaf spring and projecting away from said slot, a helical spring connected to said clip and to said button and tending to raise said shaft, and means including an air turbine for rotating said shaft.

11. In a vacuum cleaning machine, a shoe having a fan chamber and a collecting chamber and a septum therebetween, there being a communication between said dust chamber and the low pressure region of said fan chamber and said collecting chamber having a downwardly opening, laterally elongated suction mouth, a plate secured to the lower face of said septum and having a cylindrical portion, a second plate pivoted to said first plate upon an axis substantially in line with the axis of said cylindrical portion, said second plate being spaced from the wall of said shoe to form an air conduit, said first plate having an aperture in its cylindrical portion and opening into said fan chamber, and said second plate having a cylindrical portion adjacent to said first plate and arranged to close said aperture when same is shifted about its axis, an agitating device located in said collecting chamber, and an air turbine connected thereto and arranged to be operated by air passing through said conduit.

12. The combination, with a vacuum cleaner shoe having a fan chamber, a collecting chamber, and a septum between said chambers, said septum having an opening therein, of a plate secured to the face of said septum and having a cylindrical portion covering said opening, said cylindrical portion being slotted, a second plate pivoted to said first plate in line with the cylinder axis, said second plate being spaced from the wall of the shoe and having flanged ends engaging the shoe to form a passageway, said plate having a slot near its free edge and also having a projection adapted to engage the wall of the shoe and deflect the air out through the slot, agitating devices in said collection chamber, and an air turbine connected to said devices and located in line with said slot.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

JAMES B. KIRBY.

Witnesses:

HAROLD E. SMITH,
BRENNAN B. WEST.