May 18, 1937. W. D. SELLERS 2,080,510

SUCTION CLEANER

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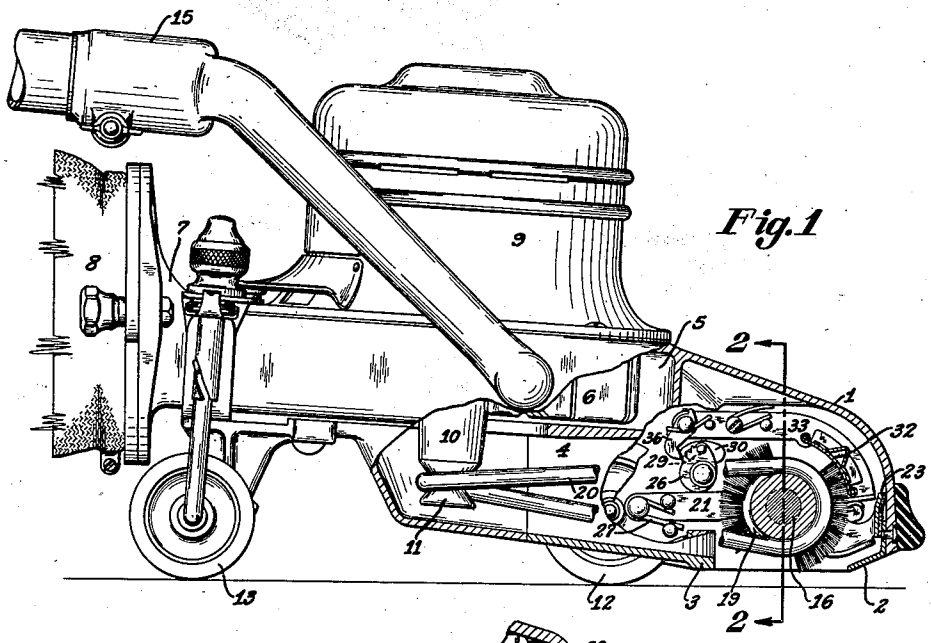


Fig. 1

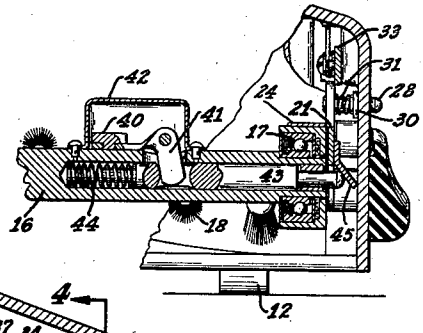


Fig. 2

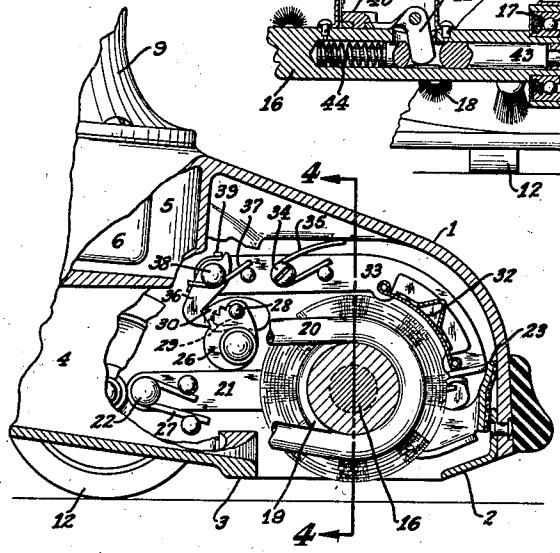


Fig. 3

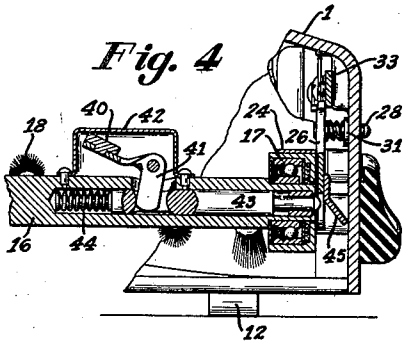


Fig. 4

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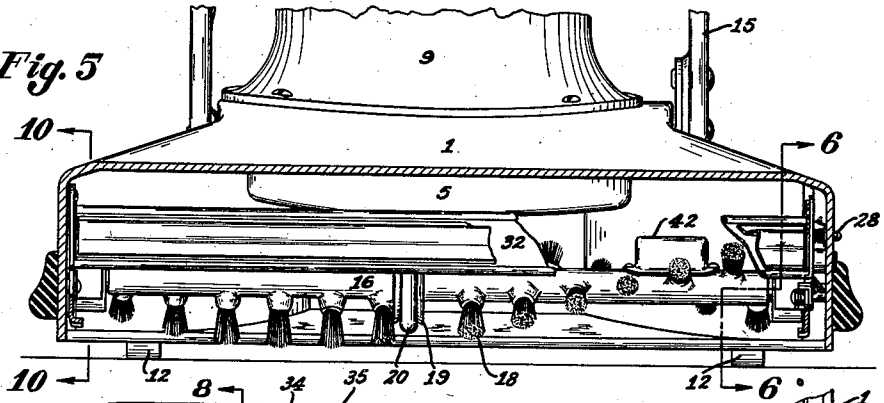
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SUCTION CLEANER

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Fig. 5



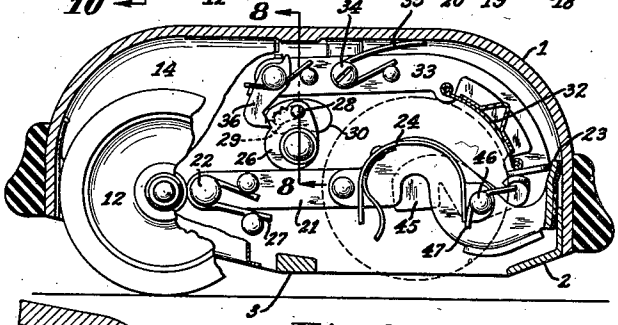


Fig. 6

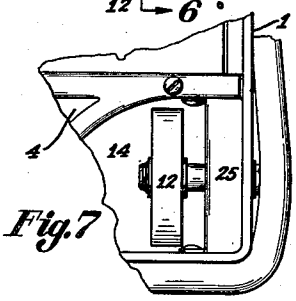


Fig. 7

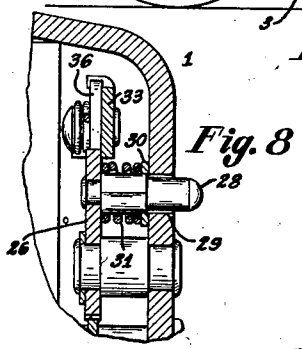


Fig. 8

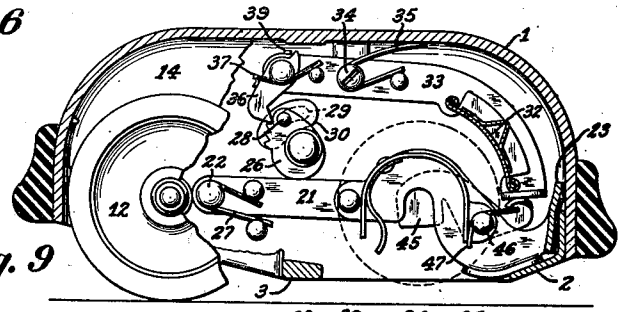


Fig. 9

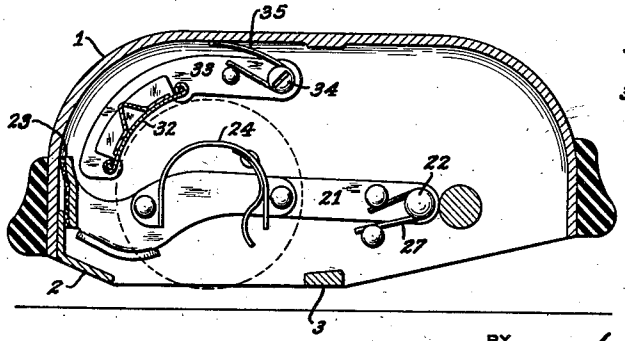


Fig. 10

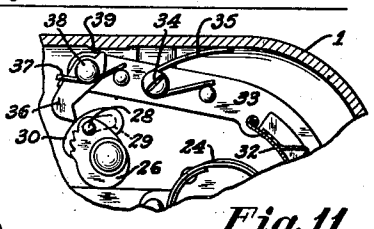


Fig. 11

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SUCTION CLEANER

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Fig. 12

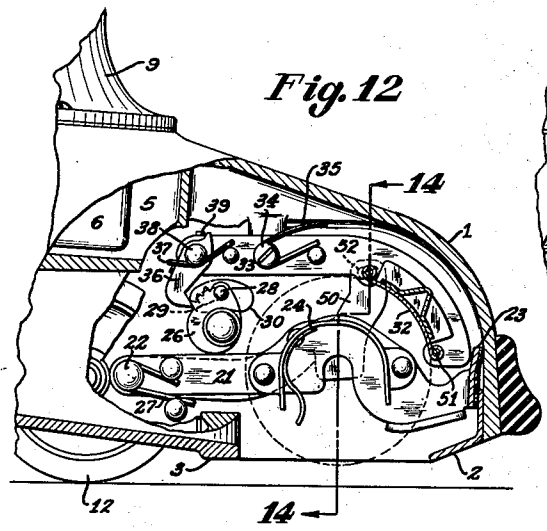


Fig. 13

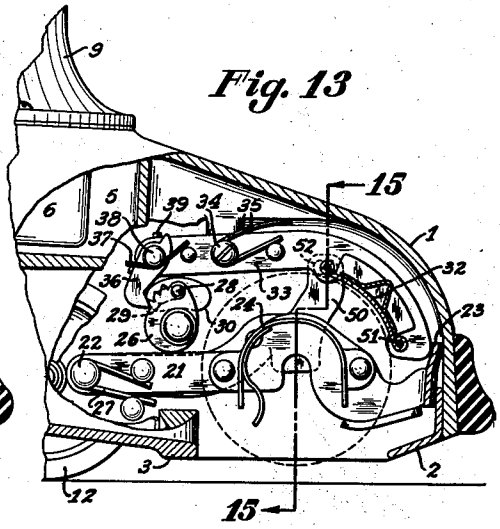


Fig. 14

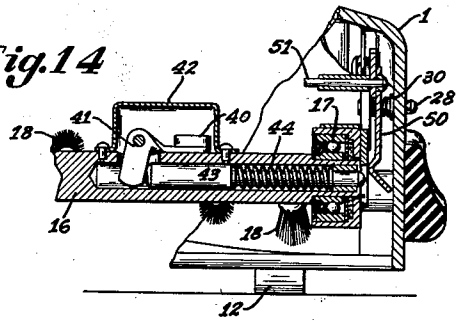
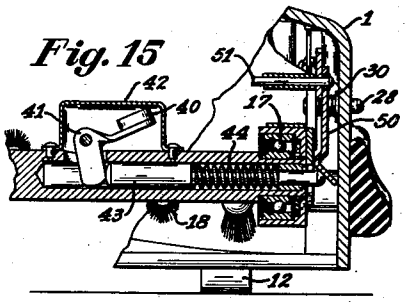


Fig. 15



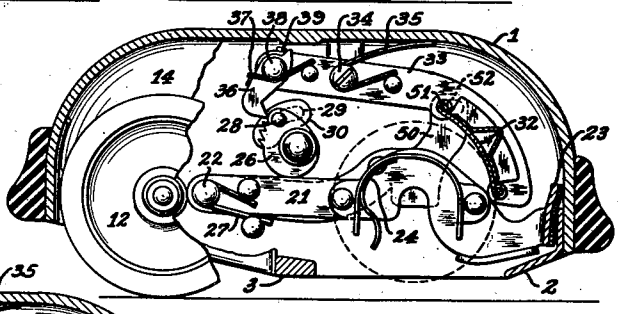


Fig. 16

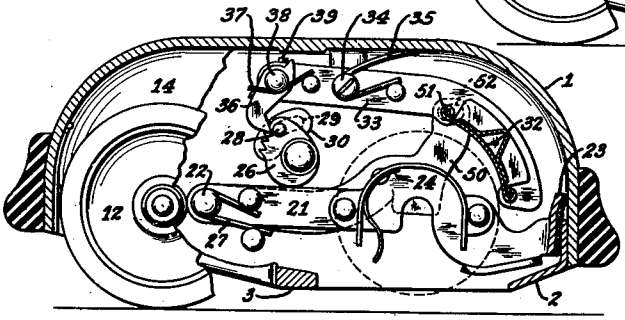


Fig. 17

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SUCTION CLEANER

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Fig. 18

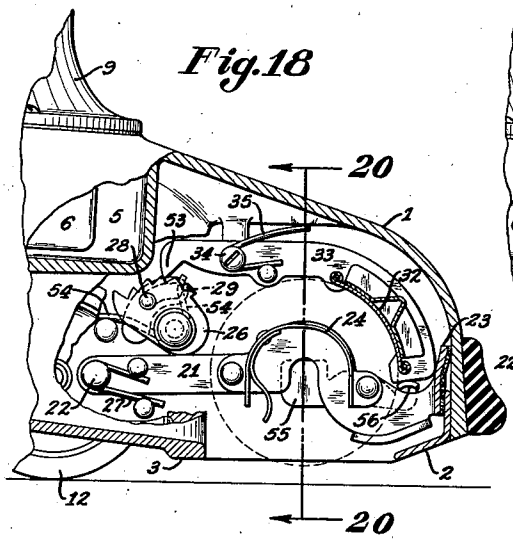
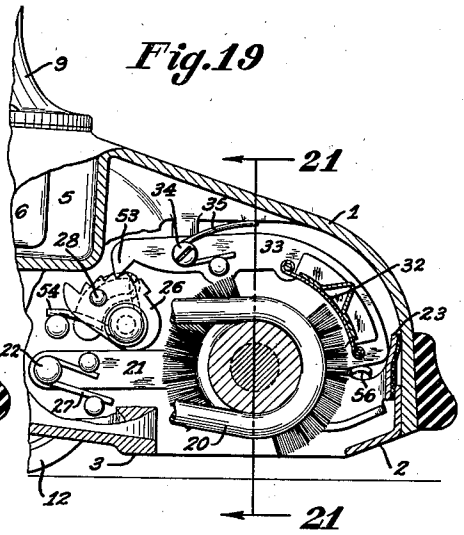


Fig. 19



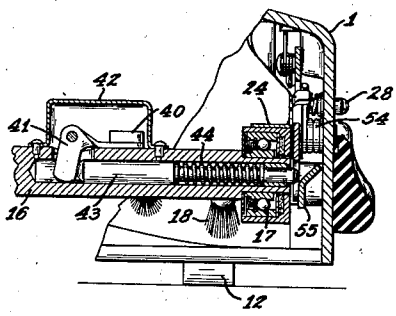


Fig. 20

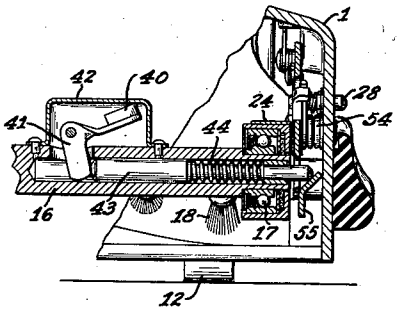


Fig. 21

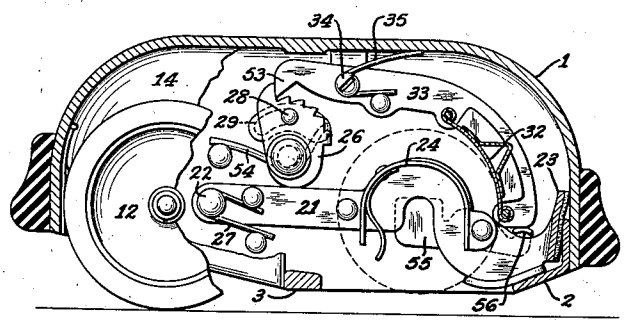


Fig. 22

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Patented May 18, 1937 2,080,510

UNITED STATES PATENT OFFICE

2,080,510

SUCTION CLEANER

William D. Sellers, Glen Ellyn, Ill., assignor to The Hoover Company, North Canton, Ohio, a corporation of Ohio

Application November 28, 1934, Serial No. 755,093

21 Claims. (Cl. 15—8)

The present invention relates to suction cleaners in general, and particularly to automatic means for adjusting a rotary agitator brush for the purpose of increasing its effective life.

It is an object of the invention to provide a new and improved suction cleaner construction. It is another object of the invention to provide new and improved agitator-mounting and adjusting means in a suction cleaner. A further object is the provision in a suction cleaner or similar machine, of an agitating element including brush bristles, in combination with means which automatically re-position the element relative to the cleaner body and to the surface covering undergoing cleaning for the purpose of increasing the effective life of the element by compensating for wear. A still further object is the provision in a suction cleaner, of a rotary brush including radially extending bristles, the length of which decrease with use, in combination with mounting means which lower the brush relative to the cleaner body as the length of the bristles decreases due to wear. Still another object is the provision in a suction cleaner in the nozzle of which is a rotary agitating brush, of means to gauge automatically the effective diameter of the brush, and means to re-position the brush automatically relative to the plane of the nozzle mouth. A still further object is the provision of automatic means to re-position a rotary agitator relative to its supporting body, including centrifugally operated means. 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 preferred embodiments of the present invention are disclosed:

Figure 1 is a side elevation of a suction cleaner, certain parts being broken away to illustrate the present invention embodied therein;

Figure 2 is a partial vertical section through the cleaner nozzle upon the line 2—2 of Figure 1;

Figure 3 is a fragmentary cross section through the cleaner nozzle, similar to the showing of Figure 1, but with the agitator rotating and with the agitator-positioning mechanism positioned accordingly;

Figure 4 is a partial section through the nozzle and brush upon the line 4—4 of Figure 3 and shows the position of the centrifugally operated means in the rotating brush position;

Figure 5 is a transverse vertical cross section through the cleaner nozzle, with certain parts broken away;

Figure 6 is a section upon the line 6—6 of Figure 5 with a new brush rotating in the cleaner nozzle;

Figure 7 is a fragmentary bottom plan view showing the enclosing shroud for that part of the agitator-supporting mechanism which extends into the nozzle wheel pocket;

Figure 8 is a vertical section upon the line 8—8 of Figure 6 through the ratchet cam and its manually operated positioning means;

Figure 9 is a section similar to Figure 6 illustrating the operating position of the brush-adjusting mechanism with a worn brush, indicated by dotted lines, positioned in the nozzle;

Figure 10 is a vertical section upon the line 10—10 of Figure 5 showing the agitator-supporting and positioning mechanism at the opposite side of the nozzle;

Figure 11 is a fragmentary section similar to Figure 9 illustrating the position of the agitator-adjusting mechanism after the worn brush, illustrated in Figure 9, has been removed;

Figure 12 is a fragmentary showing of a nozzle, similar to that included in Figure 1, illustrating a second preferred embodiment of the invention with the brush standing still;

Figure 13 is a view similar to Figure 12 illustrating the position of the parts with the new brush, indicated by the dotted line, rotating;

Figure 14 is a section through the nozzle and agitator upon the line 14—14 of Figure 12, showing the position of the centrifugally operated means in the standing brush relationship;

Figure 15 is a view similar to Figure 14 being also a section upon the line 15—15 of Figure 13, illustrating the position of the parts during the rotation of the brush;

Figure 16 illustrates the relative positions of the parts with a worn brush in the inoperative relationship;

Figure 17 is a section similar to Figure 16 showing the relationship of the parts with the worn brush rotating;

Figure 18 is a fragmentary vertical section at the end of the nozzle, similar to the showings of Figures 1 and 12, illustrating a third preferred embodiment of the invention, the new brush standing still;

Figure 19 is a partial fragmentary section similar to Figure 18 illustrating the position of the parts during the rotation of the new brush;

Figure 20 is a section upon the line 20—20 of Figure 18 illustrating the position of the cen-

trifugally-actuated mechanism with the brush standing still;

Figure 21 is a section upon the line 21—21 of Figure 19 illustrating the position of the centrifugally operated mechanism with the brush rotating;

Figure 22 illustrates the final position of the agitator brush-positioning mechanism with a worn brush standing without rotation in the nozzle.

In the modern suction cleaner, cleaning is effected by the cooperative action of high velocity moving air passing over and through the surface covering undergoing cleaning, and surface-agitating means which usually comprise a rotating brush. In use the brush bristles wear away and the effective diameter of the brush is decreased. If the brush is to maintain its contact with the surface covering it must be adjusted relative to its supporting body, usually the nozzle of the cleaner, and so relative to the plane of the surface covering undergoing cleaning. If this adjustment is not made the force of the contact of the brush with the surface covering is decreased to such a point that no effective agitation takes place, or the surface covering entirely fails to contact the brush and it is completely inoperative. This adjustment may be accomplished manually or it may be made unnecessary by the substitution of a new brush each time the effective diameter of the agitator brush is materially decreased. According to the present invention means have been provided which automatically lower the rotary agitating brush relative to the cleaner body, and more particularly relative to the cleaner nozzle mouth, to bring the worn agitator brush to the same position relative to the surface covering undergoing cleaning that it had when new. The means by which this automatic adjustment is accomplished are hereinafter fully described.

Referring again to the drawings, and to Figures 1 to 11 inclusive in which the first preferred embodiment of the invention is disclosed, a modern suction cleaner is illustrated. The cleaner comprises a nozzle 1 having front and rear surface-contacting lips 2 and 3 which define the plane of its mouth. The nozzle is interiorly connected by an air passageway 4 to the fan chamber 5 in which is positioned a rotatable fan 6. Chamber 5 is provided with an exhaust outlet 7 to which a suitable dust bag 8 is removably secured. Immediately above the fan chamber 5 is positioned a motor casing 9 which houses a suitable driving motor for the suction-creating fan 6. The motor proper is not shown, but its driving shaft 10 is seen to extend through the fan chamber 5, where it carries the fan 6, and into the air passageway 4 where its lower end is provided with a pulley 11. The cleaner body is movably supported upon spaced front wheels 12, 12 and upon rear wheels 13, 13 there being only one rear wheel shown in the drawings. The front wheels 12, 12 are positioned within wheel pockets 14 which are formed at the rear corners of the nozzle 1 by the side walls of the air passageway 4. This relationship is illustrated clearly in Figure 7. As in the usual cleaner construction a handle 15 is provided through which the operator may exert the necessary propelling force for the machine, the handle being bifurcated at its lower end and pivotally connected to the casing at the sides of the fan chamber 5.

A rotary brush is positioned within the nozzle 1 and includes a longitudinally extending body 16, at the ends of which are provided bearings 17, 17 the outer races of which function as agitator supports, and bristles 18. In its operative position the brush should be so positioned relative to the nozzle 1 that its bristles 18, 18, which are spirally arranged around the body 16, extend substantially into the plane of the surface-contacting nozzle mouth defined by the nozzle lips 2 and 3. In Figures 1 and 3 a new brush is illustrated and is seen to be so positioned. In Figures 9 and 10 a brush which is substantially worn out is illustrated in dotted lines and is also seen to be so positioned. At substantially the longitudinal center of the body 16 a pulley 19 is formed and between this pulley and the pulley 11 formed upon the lower end of the motor shaft 10 there extends a power-transmitting belt 20, as in the usual cleaner construction, so that upon the rotation of the motor the agitator will also be rotated.

The agitator is supported within the nozzle by a frame comprising side arms 21, 21 which are pivoted at their rear ends on pins 22, 22 positioned within the wheel pockets 14, 14. These arms are fixedly connected at their forward ends by a front member 23 the forward face of which is lined with a sealing material such as felt so that it contacts the forward wall of the nozzle 1 in substantially air-sealing relationship. The agitator is carried by this frame through having the outer races of its bearings 17, 17 enclosed by downwardly opening spring seats 24, 24 positioned on the side arms 21, 21. This seating relationship is such that upon the physical exertion of a sufficient force the agitator may be downwardly displaced from the supporting frame, and from the seats 24, 24, to be removed through the nozzle mouth as defined by the lips 2 and 3. Within each wheel pocket there is provided a shroud 25, best illustrated in Figure 7, which houses the rear ends of the arms 21 and seals the vertical opening between the wheel pocket and the nozzle proper so that unnecessary leakage of air from the pocket into the nozzle proper is prevented.

The agitator-carrying frame is pivoted to permit movement of the brush up and down within the nozzle but it is normally retained in the uppermost position permitted by a ratchet cam 26, which contacts one of the side arms 21 on its cam face, by a coil spring 27. Spring 27, which seats upon the pivot pin 22 of the arm 21, resiliently urges the arm upwardly into contact with the ratchet cam, as illustrated, for example, in Figures 1 and 3. Cam 26 is so shaped that its rotation in a counter-clockwise direction, as viewed in Figures 1 and 3, forces the agitator downwardly. Cam 26 is rotatably mounted upon the side wall of the nozzle and is provided with an outwardly or axially extending pin 28 which extends through an arcuate slot 29 in the side wall of the nozzle and permits of the manual adjustment of the cam under certain conditions. The arcuate slot 29 is closed by a plate 30 carried by pin 28 and spring-pressed against the inner side of the nozzle wall by a coil spring 31 carried by the pin. This coil spring performs a double function in that it serves to hold plate 30 in slot-sealing relationship and also exerts sufficient force to maintain the ratchet cam in a given position against unintended displacement.

As the position of the ratchet cam 26 determines the position of the agitator-supporting frame, and so that of the agitator, means are provided which automatically rotate this cam step by step as the agitator diameter is decreased by wear. This is accomplished by means of

agitator-diameter-gauging means and means to exert a rotating force upon the cam. The agitator diameter-gauging means comprises a brush-contacting shoe 32 which extends along the top forward part of the agitator being supported at its ends by arms 33, 33 which are pivoted to the side walls of the nozzle upon pins 34, 34. Each arm 33 is urged downwardly, so that shoe 32 moves into contact with the outer periphery of the brush, by a coil spring 35 carried by the pivot pin 34. At the ratchet cam end of the nozzle the arm 33 extends rearwardly of its pivot pin, as shown in Figure 9, and is provided at its end with a pivoted pawl 36 the lower toothed end of which is adapted to engage selectively the teeth of the ratchet cam 26. A coil spring 37 carried by the pivot pin 38 of the pawl resiliently urges the pawl in the direction of the teeth of the cam. A stop 39, however, is provided on arm 33 which contacts the pawl and prevents its contact with the ratchet cam when the shoe-carrying arm is pivoted to its lowest position, as when the brush is entirely removed, as illustrated in Figure 11.

Contact of shoe 32 with the surface of the agitator brush in the operation of the machine and during rotation of the brush is obviously undesirable as an unnecessary load would be placed on the driving motor. To prevent this contact centrifugally controlled means are provided which lift the shoe-carrying arms 33, 33 during brush rotation, at the same time lowering the pawl 36, and in the event the pawl is in engagement with a tooth of the ratchet cam that member may also be moved. This centrifugally operated means comprises a weight 40 which is pivotally carried by an L-shaped lever 41 on the surface of the agitator body 16, and within an enclosing housing 42. The inner end of lever 41 extends into the agitator 16, which is bored at its end, and seats in a sliding plunger 43 which is urged by a coil spring 44 at its inner end in the direction of the end of the agitator. The end of the plunger is reduced in diameter and in its outer position extends from the end of the body 16, the side member 21 of the agitator-supporting frame being curved upwardly at that point to avoid the plunger. A pivoted lever 45, provided with a cam face adjacent the end of the plunger 43, is carried by the forward end of arm 21 upon a pin 46. Forward of the pin 46 lever 45 contacts the underside of a shoulder formed upon the shoe-carrying arm 33. A coil spring 47 carried by the pivot pin 46 normally urges the forward end of the lever 45 upwardly into contact with the arm 33 and is of sufficient force to lift upwardly that arm and the shoe 32, and so the arm 33 at the opposite side of the nozzle, until the shoe is out of contact with the brush. To make this relationship possible the force exerted by the spring 27, which urges the agitator-carrying frame upwardly, must be of sufficient strength to prevent the downward movement of the frame under the force exerted by spring 47. In addition the relationship between the forces exerted, and the lever arms present, must be such that the arm 33 can pivot upwardly under the force exerted by spring 47 against the opposing force exerted by coil spring 35 which normally urges the arm 33 downwardly.

The operation of this embodiment of the invention is easily understood. With a new brush positioned within the nozzle and carried by the agitator-supporting frame, being seated within the agitator seats 24, 24, the relationship of parts with the brush not rotating is as indicated in Figures 1 and 2 of the drawings. The brush-diameter-gauging shoe 32 contacts the periphery of the brush along its top front side. The ratchet cam 26 is in its new brush position and the pawl 36 lies adjacent the first tooth of the series of teeth on the ratchet. The spring-pressed plunger has been urged outwardly by its coil spring 44 into contact with the cam face of pivot lever 45 and has pivoted the rear end of that lever upwardly resulting in the lowering of the forward end thereof, against the spring force exerted by coil spring 47, thereby permitting the shoe 32 to be moved into contact with the brush periphery by the action of coil springs 35, 35 acting upon lever arms 33, 33.

Upon the closing of the operating switch of the cleaner and the rotation of the cleaner motor, the fan, the driving pulley 11 and the agitator are rotated. Upon attaining a sufficient speed the weight 40 carried by the brush is thrown outwardly by centrifugal force from the position shown in Figure 2 to that shown in Figure 4. This action causes the pivotal movement of lever 41 and plunger 43 is forced inwardly into the agitator body against the force exerted by its coil spring 44. This movement withdraws the end of plunger 43 from contact with the cam face of lever 45 and permits the coil spring 47 acting upon that lever to raise the forward end thereof upwardly to lift the shoe-carrying arms 33, 33 and the shoe 32 from its contact with the rotating agitator.

At the end of the cleaner operation, and upon the agitator coming to a stop, weight 40 again assumes the position shown in Figure 2 and plunger 43 is again forced outwardly by its spring resulting in the raising of the cam end of pivoted arm 45 thereby permitting the lowering of shoe 32 under the action of coil spring 35. If the operation has been of sufficient duration to produce appreciable brush wear the forward end of arms 33, 33 will pivot to a lower position than they formerly assumed in the inoperative relationship, their position being determined by the position of the shoe 32 when in contact with the surface of the brush. Obviously the lesser the diameter of the brush the lower will be the position of shoe 32 and the greater will be the pivotal movement of the arms 33, 33. As the forward end of arm 33 at the ratchet end of the nozzle is lowered the rearward end thereof is raised, and if the movement of the arm, as gauged by the shoe 32, is sufficient the pawl 36 slips over and engages the first tooth of the series of teeth on ratchet 26. In the disclosures of Figure 9 the brush diameter has been decreased to such a point that the brush is practically worn out and the pawl has moved to the final tooth on the ratchet cam. In normal usage this would never be accomplished in one use operation of the cleaner. In such operation the pawl would practically never move more than one tooth of the ratchet at a time. Assuming that the pawl 36 has engaged the first tooth of the ratchet 26 no movement of the ratchet takes place until the cleaner is again placed in operation. Upon the starting of the cleaner operation and the radial movement of the weight 40 under centrifugal force the forward end of each arm 33 is again forced upwardly under the action of spring 47 and the rearward end of the pawl-carrying arm is forced downwardly. This movement of arm 33 forces pawl 36 downwardly and ratchet cam 26 is rotated to the extent of that movement which is just sufficient to lower the

brush so that its lower end extends in the same position relative to the plane of the nozzle mouth as it extended before any wear took place. The relationship between the teeth of the ratchet cam 26 and of the pawl 36 is also such that the pawl 36 will only engage a new tooth of the ratchet cam when the agitator-diameter-gauging mechanism detects a definite and predetermined decrease in the brush diameter.

After the agitator brush has been reduced in diameter beyond a certain point it is desirable that it be replaced. Such a condition is indicated in Figure 9 where no further possible adjustments or lowering of the agitator-supporting mechanism is possible. It is then necessary to remove the agitator and to replace it by a new member. This requires only the downward displacement of the agitator from the nozzle and includes the unseating of the bearings 17, 17 from their seats 24, 24 in the agitator-supporting side arms 21, 21. Figure 11 illustrates the position of the parts after this operation has been completed. Under the operation of the downwardly forcing spring 35 the shoe-carrying arms 33, 33 have been pivoted to their lowermost position and the rear end of the pawl-carrying arm 33 contacts the upper wall of the nozzle. The pawl-pivoting spring 37 is unable to move the pawl into contact with the teeth of the ratchet cam 26 in this position as the toothed end of the pawl is beyond the radius of the teeth and further pivotal movement of the pawl is prevented by the stop 39. Before the new brush is positioned the operator manually rotates the ratchet cam 26 in a clockwise direction, as viewed in Figure 11, through a force exerted upon the pin 28 which extends through the nozzle side wall as clearly evidenced in Figure 8. The ratchet cam is moved from its position illustrated in Figure 9 to the new brush position illustrated in Figure 1. Thereafter the new brush can be inserted and the relationship of the parts will again be that illustrated in Figure 1.

Referring now to Figures 12 to 17, inclusive, a second preferred embodiment of the invention is disclosed. Except as hereinafter stated this embodiment is similar to that first described and the same parts have the same reference characters. In the first described embodiment the brush-contacting-diameter-gauging shoe 32 was normally held out of engagement with the rotating brush by means of the spring-urged pivoted arm or lever 45 which was carried by the agitator-supporting arm 21. According to the present embodiment that lever arm 45 with its spring 47 has been eliminated and in its place is provided a lever arm 50 which is pivoted upon the pivot pin 22 of the agitator-supporting arm 21 but is free for independent movement relative thereto. Arm 50 is provided at its forward end with a pin 51 which extends across the nozzle between arms 33, 33, being slidable in a substantially horizontal slot 52 in each, and also supports one end of the shoe 32. Pivoted lever 50 is also provided with a cam face adjacent the end of plunger 43 which, in the present embodiment is urged inwardly into the agitator body 16 by its coil spring 44. A weight 40 is again carried by the pivoted L-shaped arm or lever 41 within the housing 42 and in this embodiment contacts plunger 43 to urge it outwardly in the rotation of the brush.

In the operation of this embodiment the rotation of the brush results in the outward radial movement of the centrifugally operated weight 40 and the plunger 43 is moved longitudinally and outwardly from the agitator body against the force exerted by the coil spring 44. The end of the plunger contacts the cam face of lever 50 resulting in the raising of that member. As lever 50 is connected through pin 51 at its upper end to the shoe-supporting arms 33, 33, those arms are also moved upwardly and the shoe 32 is lifted from contact with the brush. Upon the cessation of agitator rotation the plunger is forced inwardly under the force exerted by its spring 44 and the brush-contacting shoe 32 is moved into contact with the brush periphery under the action of the arm-pivoting springs 35, 35. The adjustment of the ratchet cam by the pawl 36 is accomplished in this embodiment as the shoe is lifted from the brush in the exact manner of the first embodiment.

Referring now to Figures 18 to 22, inclusive, a third preferred embodiment of the present invention is disclosed. According to this embodiment of the invention the agitator is again supported within the nozzle upon the agitator-supporting frame which is spring-pressed upwardly. The brush-contacting shoe 32 is again carried by spaced arms 33, 33 at the opposite ends of the nozzle and the shoe is normally spring-urged in the direction of the brush by the coil springs 35, 35. According to this embodiment, however, no pawl of the pivoted type is provided at the rear end of the arm 33. Instead a rigid pawl 53 is provided which is adapted to seat selectively within the series of teeth of the ratchet cam which is itself provided with a coil-spring 54 which urges it in a clockwise direction as viewed in Figures 18 and 19. Its movement in this direction is prevented only by the engagement of the pawl 53 with the teeth. To raise the brush-contacting shoe 32 from the agitator in its rotation the centrifugally-actuated weight 40 is again provided which forces the plunger 43 outwardly against the force of its coil spring 44 and into contact with the cammed outer end of the lever arm 55 which is mounted on the side arm 21 similarly to the lever arm 45 of the first embodiment. In the case of lever arm 55, however, no coil spring urges the forward end of the arm upwardly to move the shoe 32 from contact with the brush. Instead the movement of the plunger 43 against the cam surface of the arm results in the downward movement of the rear end of the arm and the upward movement of the forward end of the arm to lift the brush. In the rotation of the brush with the plunger extended outwardly under the action of the centrifugally operated weight the rearward end of arm 55 will be lowered, as stated, and the brush-contacting shoe 32 will be raised from contact with the brush.

In this embodiment the lowering of the agitator-carrying frame upon brush wear is again accomplished by the rotation of the ratchet cam 26. At the end of each cleaning operation as the weight 40 becomes ineffective and the plunger 43 is moved inwardly under the force of its spring 44 the shoe 32 is lowered into contact with the brush by the action of spring 35, the arm 55 pivoting downwardly until its forward end, which is overturned as at 56, rests upon the side arm 21. The new-brush positions, inoperative and operative, are illustrated in Figures 18 and 19 respectively, and the ratchet cam is seen to be moved in a counter-clockwise direction to as far as possible. This adjustment is again accomplished by the manually-operable pin 28 which

extends through the outer wall of the nozzle casing. In the new brush position the toothed pawl **53** contacts the first tooth of the ratchet cam. As the shoe **32** is lowered into contact with the brush as the brush ceases to rotate the pawl **53** is raised and if the movement of the arm **33**, as determined by the shoe, is sufficient a tooth of the ratchet slides under the pawl and the ratchet cam rotates in a clockwise direction under the force exerted by its coil spring **54**, the agitator-carrying arm **21** being forced downwardly. The pawl **53** contacts the following tooth of the ratchet cam, however, and further movement is prevented. This relationship continues until all of the teeth have passed under the pawl **53** and the parts have assumed the relationship shown in Figure 22. It is then time to replace the rotary brush and after this has been accomplished the ratchet cam is manually moved counter-clockwise by the pin **28** to the position shown in Figure 18 and the machine is again ready for automatic adjustment during the complete life of the brush. As distinguished from the first two embodiments the adjustment of the height of the agitator-carrying frame takes place at the end of each cleaning operation instead of at the beginning.

I claim:

1. In a suction cleaner, a body, a rotary brush, means mounting said brush on said body for movement toward and from a surface covering undergoing cleaning, and automatic means to effect a lowering of said brush including centrifugally operated means, adjustable means to lower said brush in certain adjustments by a force exerted by said centrifugally operated means, and means responsive to change in the diameter of said brush controlling the adjustment of said adjustable means.

2. In a suction cleaner, a nozzle, a rotary brush in said nozzle, a pivoted arm adjustably supporting said brush in said nozzle, means to force said arm downwardly to lower said brush including a ratchet cam operatively connected to said arm and a pawl cooperating with said cam, a second pivoted arm supporting said pawl, a shoe adapted to contact said brush in certain positions of said second arm and carried thereby, resilient means acting on said second arm to urge said shoe into contact with said brush, and centrifugally operated means responsive to the rotation of the brush for raising the shoe therefrom.

3. In a suction cleaner, a body, a rotary agitator brush, means movably mounting said brush, spring means urging said brush upwardly, a cam contacting said mounting means and movable to force said means downwardly against the force exerted by said spring means, means responsive to change in the diameter of said brush, cooperating means between said responsive means and said cam relatively positioned by said responsive means, said cooperating means being adapted to exert a moving force on said cam, and centrifugally operated means rotatable with said brush to move said responsive means from said brush and to actuate said cooperating means.

4. In a suction cleaner, a body, a rotary agitator brush, means movably mounting said brush, spring means urging said brush upwardly, a cam contacting said mounting means and movable to force said means downwardly against the force exerted by said spring means, means responsive to changes in diameter of said brush, cooperating means between said responsive means and said cam relatively positioned by said responsive means, said cooperating means being adapted to exert a moving force on said cam, spring means to raise said responsive means from said brush and to actuate said cooperating means, and means centrifugally held in an inoperative position in the rotation of said brush, but operative when said brush is standing to force said responsive means into contact with said brush.

5. In a suction cleaner, a body, a rotating brush, means supporting said brush for vertical movement relative to said body, means to lower said supporting means comprising a ratchet cam, a pawl adapted to engage successively the teeth of said ratchet cam, means to control the adjustment of said pawl relative to said cam comprising brush-diameter change-responsive means, and centrifugally operated means rotatable with said brush to exert a force on said pawl to move said cam.

6. In a suction cleaner, a body, a rotating brush, means supporting said brush for vertical movement relative to said body, means to lower said supporting means comprising a ratchet cam, means to actuate said cam including a pawl adapted to engage successively the teeth of said ratchet cam, means to control the adjustment of said pawl relative to said cam comprising brush-diameter change-responsive means, and centrifugally operated means rotatable with said brush to render said responsive means inoperative during the rotation of said brush.

7. In a suction cleaner, a body, a rotatable brush, means adjustably supporting said brush on said body, means adapted to transmit a force to move said brush relative to said body, brush-diameter-change-responsive means controlling said last mentioned means, and centrifugally operated means actuated by said brush to render said responsive means inoperative during the rotation of said brush.

8. The construction recited in claim 7 characterized in that said centrifugally operated means are carried by said brush.

9. The construction recited in claim 7 characterized in that said centrifugally operated means are connected to said force-transmitting means and are adapted to deliver force thereto.

10. In a suction cleaner, a body, a rotatable brush, means movably mounting said brush on said body, means to adjust said brush relative to said body and to a surface covering undergoing cleaning including means to move said mounting means, a brush-diameter-change-responsive means controlling said last mentioned means, and means responsive to rotational forces to hold said responsive means inoperative during cleaner rotation.

11. In a suction cleaner, a body, a rotatable brush, means adjustably mounting said brush on said body, means to adjust said brush relative to said body and to a surface covering undergoing cleaning including a spring-urged ratchet cam to move said mounting means, a pawl determining the position of said ratchet cam, brush-diameter-change-responsive means controlling said pawl, and means to render said responsive means inoperative during the rotation of said brush.

12. In a suction cleaner, a body, a rotatable brush, a frame mounting said brush for vertical movement relative to said body, spring means urging said frame upwardly, means determining the upper position of said frame, brush-diam-

eter-responsive means determining the position of said last mentioned means, and means responsive to centrifugal forces determining the position of said responsive means.

13. In a suction cleaner, a body, a rotatable brush, a frame mounting said brush for vertical movement relative to said body, spring means urging said frame upwardly, a rotatable cam determining the upper position of said frame and movably mounted to force it downwardly against the force exerted by said spring, relatively adjustable means to rotate said cam in certain adjustments, brush-diameter-change-responsive means controlling the relationship of said relatively adjustable means, and means responsive to rotational forces determining the position of said responsive means.

14. In a suction cleaner, a body, a rotatable brush, a frame mounting said brush for vertical movement relative to said body, spring means urging said frame upwardly, a rotatable cam determining the upper position of said frame and movably mounted to force it downwardly against the force exerted by said spring, means exerting a force to move said cam to force said frame downwardly, means preventing the movement of said cam, brush-diameter-change-responsive means controlling said last mentioned means and adapted to adjust said last mentioned means to permit said cam to be moved upon registering a predetermined decrease in agitator diameter, and centrifugally operated means to move said responsive means to an inoperative position during the rotation of said brush.

15. In a suction cleaner, a body, a rotatable brush, a frame mounting said brush for vertical movement relative to said body, spring means urging said frame upwardly, a rotatable cam determining the upper position of said frame and movably mounted to force it downwardly against the force exerted by said spring, relatively adjustable means to rotate said cam in certain adjustments, brush - diameter - change - responsive means controlling the relationship of said relatively adjustable means, means urging said responsive means into its diameter-change-determining position, a weight carried by said brush and movable radially under centrifugal force during the rotation thereof, and means actuated by the force exerted by said weight to move said responsive means from its diameter-change-determining position during the rotation of said brush.

16. In a suction cleaner, a body, a rotatable brush, a frame mounting said brush for vertical movement relative to said body, spring means urging said frame upwardly, a rotatable cam determining the upper position of said frame and movably mounted to force it downwardly against the force exerted by said spring, relatively adjustable means to rotate said cam in certain adjustments, brush - diameter - change - responsive means controlling the relationship of said relatively adjustable means, spring means urging said responsive means into its diameter-change-determining position, second spring means adapted to overcome the force exerted by said first mentioned spring means to move said responsive means from said position, and centrifugally operated means to release said second spring means to overcome said first mentioned spring means during the rotation of said brush.

17. In a suction cleaner, a body including a nozzle, a rotatable brush, means mounting said brush in said nozzle for vertical movement, means in said nozzle to adjust automatically said brush vertically including brush-diameter-change-responsive means to determine the necessity of adjustment and centrifugally operated means to move said responsive means.

18. In a suction cleaner an agitator including an element subjected to wear from use, means to alter the position of said element to compensate for wear, and means responsive to wear in said element to actuate said last mentioned means and including motor-driven centrifugal means.

19. In a suction cleaner an agitator including a rotating agitating element subjected to wear in use resulting in dimensional change, means to alter the position of said element to compensate for such change, and means responsive to change in said element to actuate said last mentioned means and including motor-driven centrifugal means.

20. In a suction cleaner, an agitator including an element subjected to wear in the operation of the cleaner, means responsive to change in said element and means controlled by said responsive means and including motor-driven centrifugal means to effect step-by-step adjustment of said element to compensate for wear.

21. In a suction cleaner, an agitator including an element subjected to wear in the operation of the cleaner, means responsive to change in said element, and means controlled by said responsive means operative at the end of cleaner operation to effect adjustment of said element to compensate for wear.

WILLIAM D. SELLERS.

CERTIFICATE OF CORRECTION.

Patent No. 2,080,510. May 18, 1937.

WILLIAM D. SELLERS.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 5, second column, line 75, page 6, first column, line 1, claim 12, for "brush-diameter-responsive" read brush diameter-change-responsive; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 24th day of August, A. D. 1937.

Leslie Frazer

(Seal) Acting Commissioner of Patents.