July 14, 1942. J. B. KIRBY 2,289,711

SUCTION CLEANER

Filed Nov. 13, 1939 3 Sheets-Sheet 1

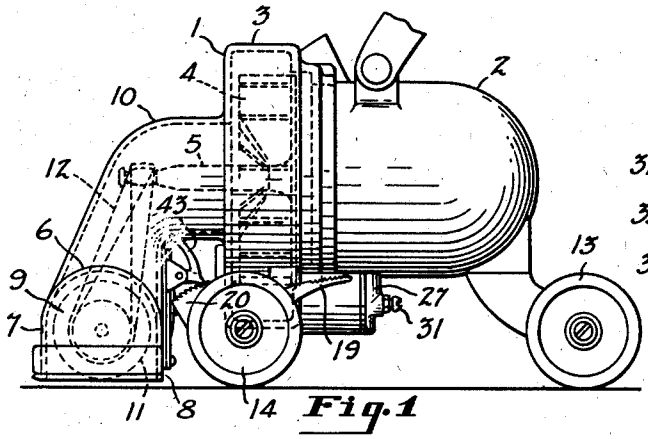

Fig. 1

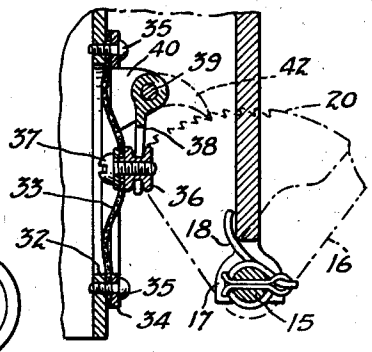

Fig. 4

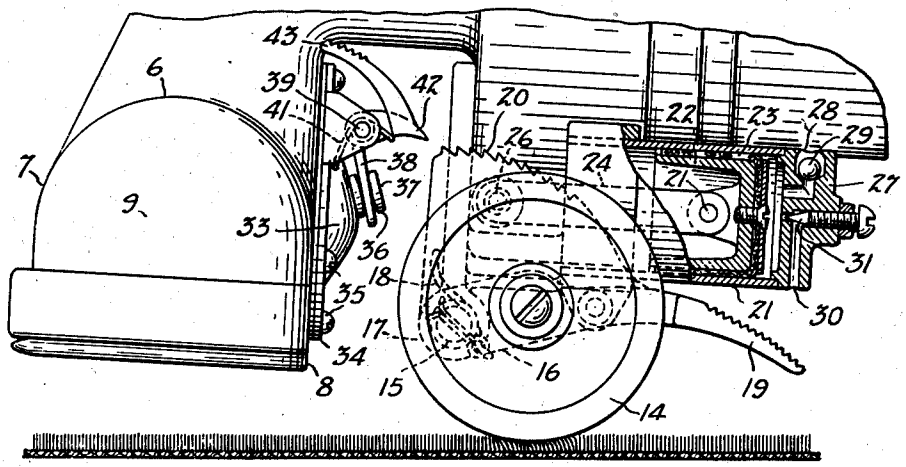

Fig. 2

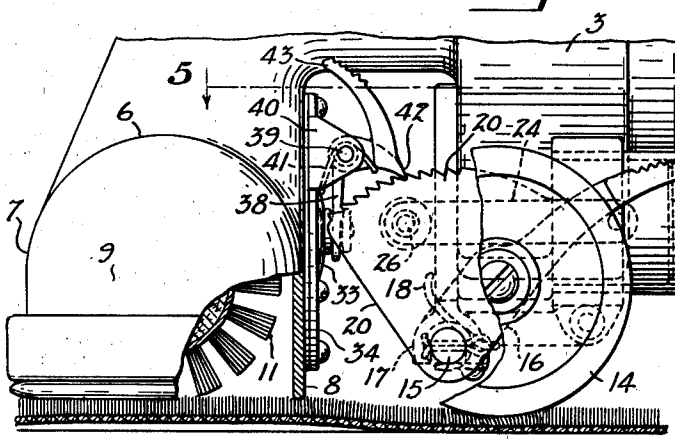

Fig. 3

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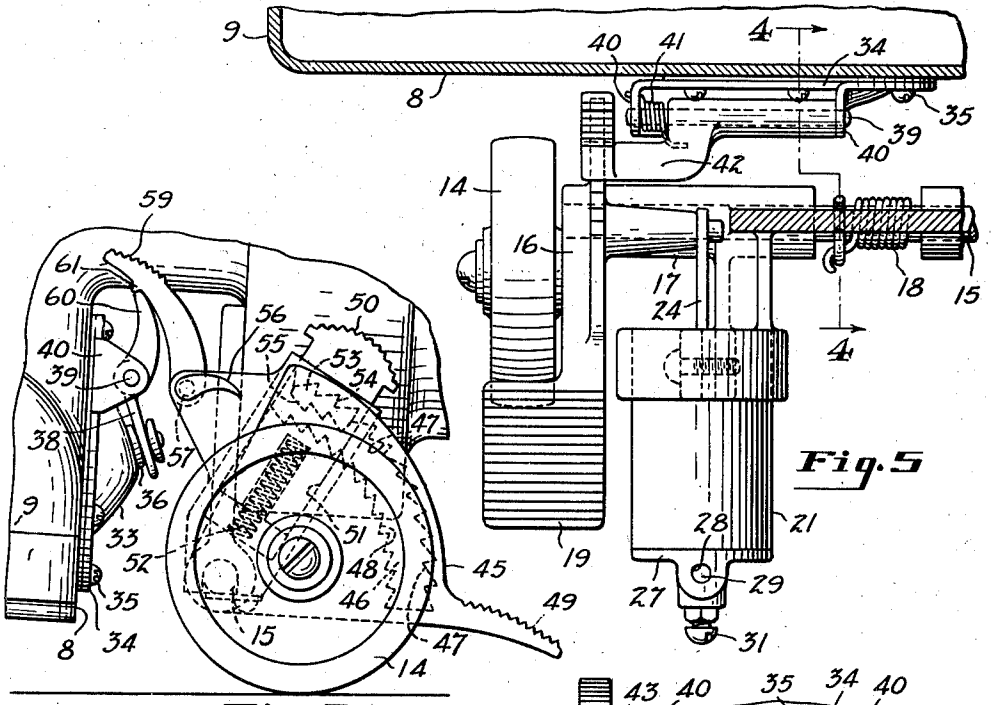

Fig. 5

Fig. 7

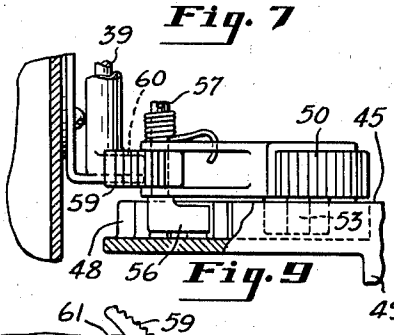

Fig. 9

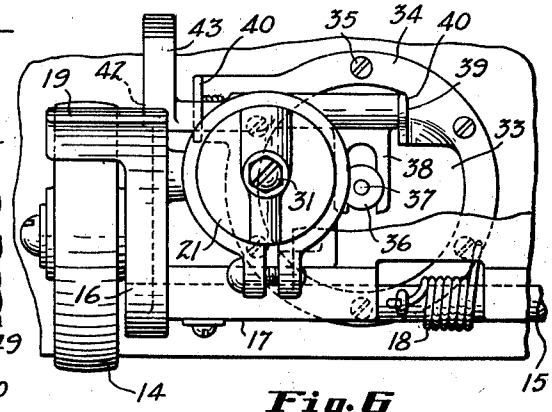

Fig. 6

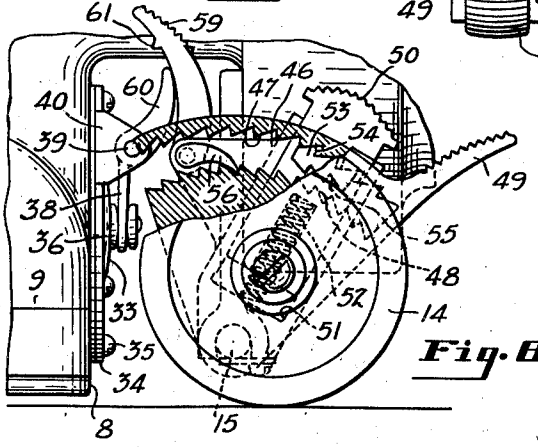

Fig. 8

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SUCTION CLEANER

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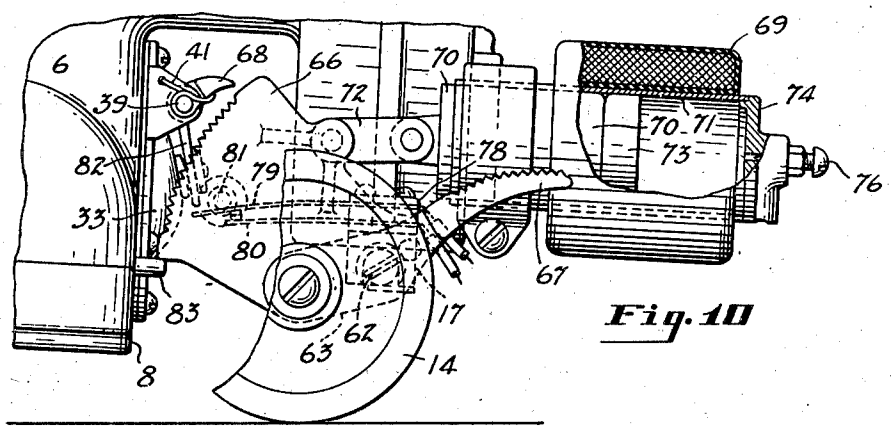

Fig. 10

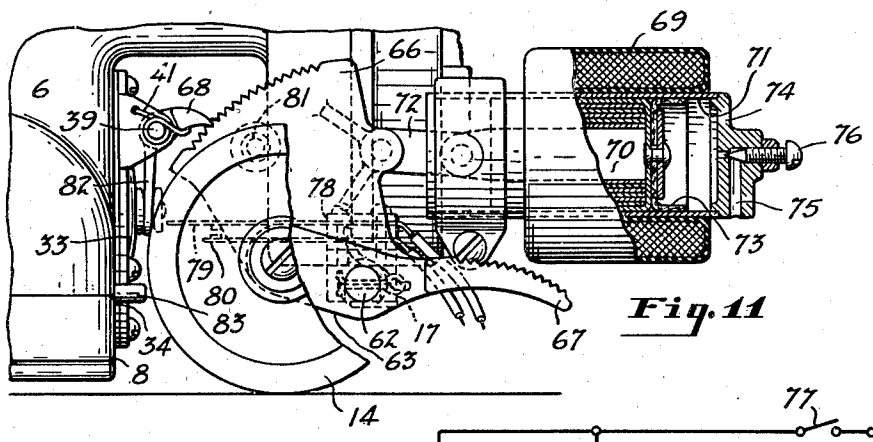

Fig. 11

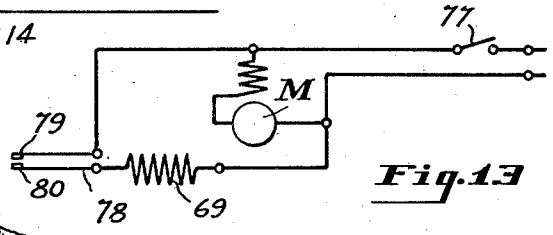

Fig. 13

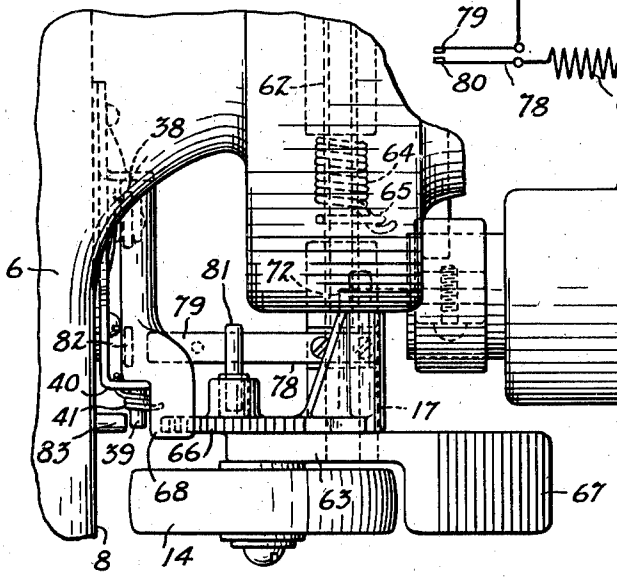

Fig. 12

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Patented July 14, 1942 2,289,711

UNITED STATES PATENT OFFICE

2,289,711

SUCTION CLEANER

James B. Kirby, West Richfield, Ohio

Application November 13, 1939, Serial No. 303,987

10 Claims. (Cl. 15—16)

This invention relates to suction cleaners or suction sweepers and has for its object to provide means for quickly and easily adjusting the suction nozzle to the proper position for obtaining the maximum efficiency in cleaning a carpet, the position to which the nozzle is adjusted being preferably controlled by a device which is acted upon by the air pressure within the nozzle.

In cleaning carpets with a suction cleaner it is desirable that the portion of the carpet engaged by the nozzle be lifted slightly from the floor so that air flowing into the nozzle may be drawn by suction from beneath the carpet and through the same in order to extract dirt from the body of the carpet. A beater or brush mounted in the slot of the suction nozzle has a more effective action upon the carpet to loosen dirt lodged therein when the position of the nozzle is such as to hold the portion of the carpet engaged by the brush or beater out of contact with the floor. Various devices have been provided for vertically adjusting the suction nozzle with respect to its supporting wheels. Such adjusting devices are, however, not entirely satisfactory for the reason that it is very difficult for the operator to accurately determine the most advantageous adjustment. Furthermore, in many homes the suction cleaner is operated successively upon rugs and carpets varying in weight and texture and operators will seldom attempt to readjust the nozzle for each carpet or rug.

An important object of the present invention is to provide an adjusting device which is not dependent upon the skill of the operator and by which the nozzle may be shifted manually to a non-operating position and thereafter moved toward operating position and automatically locked in the proper position of adjustment with respect to the carpet upon which the cleaner is resting.

Another object of the invention is to provide a suction nozzle having a wheeled support with means for elevating the nozzle with respect to the support and means for controlling downward movement of the nozzle in such a manner as to arrest the downward movement of the nozzle and lock it in position with respect to its support in the proper position with respect to the particular carpet upon which the sweeper is operating.

The present invention has for an object to provide a means for positioning the nozzle at the proper elevation by so controlling a nozzle locking device that the downward movement of the nozzle is stopped at substantially the instant when the carpet is drawn by suction against the nozzle opening.

A further object of the invention is to provide a diaphragm operated detent which is shifted into engagement with the nozzle support to lock the nozzle in a fixed position with respect to the said support by the decrease in pressure within the nozzle due to engagement of the carpet with the suction nozzle.

A further object of the invention is to provide a means for effecting an automatic adjustment of the suction nozzle by which the suction nozzle is locked in a fixed position with respect to its support, the locking means being such that the nozzle is retained in the position to which it has been adjusted until the locking means is manually released for a new adjustment.

A further object of the invention is to provide a suction cleaner having a nozzle which is automatically lifted to a non-operating position whenever the motor circuit is broken, which is automatically moved downwardly toward the floor when the motor circuit is closed, and which is automatically locked against further downward movement when the pressure within the nozzle is decreased by engagement of the nozzle with the carpet.

A further object is to provide means for automatically moving the nozzle downwardly and relocking the same in carpet engaging position whenever the engagement between the nozzle and carpet is broken.

With the above and other objects in view, the invention may be said to comprise the device illustrated in the accompanying drawings hereinafter described and particularly set forth in the appended claims, together with such variations and modifications thereof as will be apparent to one skilled in the art to which the invention appertains.

Reference should be had to the accompanying drawings forming a part of the specification, in which:

Figure 1 is a side elevation of a suction cleaner embodying the invention;

Fig. 2 is a fragmentary side elevation on an enlarged scale showing the nozzle in elevated position, the dashpot cylinder which retards gravity movement of the nozzle being shown in section;

Fig. 3 is a fragmentary side elevation similar to Fig. 2 showing the nozzle in carpet engaging position;

Fig. 4 is a fragmentary section taken on the line indicated at 4—4 of Fig. 5;

Fig. 5 is a fragmentary section taken on the line indicated at 5—5 of Fig. 3;

Fig. 6 is a fragmentary rear elevation of the nozzle actuating and controlling mechanism;

Figs. 7, 8, and 9 are fragmentary detail views showing the invention applied to a sweeper having a different form of nozzle raising and lowering device, Fig. 7 being a fragmentary side elevation showing the nozzle in elevation position, Fig. 8 being a fragmentary side elevation showing the nozzle lowered to carpet engaging position, and Fig. 9 being a fragmentary top plan view of the locking pawl;

Figs. 10, 11, 12, and 13 show a modified embodiment of the invention in which the adjustment of the nozzle is automatically effected when the operating motor is started;

Fig. 10 is a fragmentary side elevation showing the nozzle in elevated position;

Fig. 11 is a fragmentary side elevation showing the nozzle in carpet engaging position;

Fig. 12 is a fragmentary plan view of the nozzle adjusting devices; and

Fig. 13 is a wiring diagram showing solenoid and motor circuits and the controlling switches.

The present invention is applicable to suction cleaners of the type in which means is provided for raising the suction nozzle to a position clear of the carpet and lowering the same to carpet engaging position and includes a device for automatically stopping the downward movement of the nozzle and locking the same in a fixed position with respect to its support when the carpet is sucked against the nozzle opening. In the accompanying drawings the invention is shown applied to a suction sweeper having a casing 1 which includes a motor housing 2 and fan housing 3, in which a fan 4 is mounted upon a shaft 5 which may be the shaft of the driving motor. A transversely elongated suction nozzle 6 is provided with front and rear walls 7 and 8 and end walls 9 to provide a rectangular suction opening at its lower end which is disposed horizontally over the surface to be cleaned. The nozzle 6 is connected centrally by means of a tubular neck portion 10 to the inlet of the fan housing 3. A rotary brush or beater 11 may be mounted within the nozzle 6. This brush or beater preferably extends substantially the full length of the nozzle opening and is disposed with its lower edge at or slightly below the plane of the nozzle opening. The brush 11 may be driven from the shaft 5 by suitable means such as a belt 12. The casing 1 is supported upon rear wheels 13 and upon a pair of front wheels 14 which are mounted at opposite ends of a crank axle 15. The crank axle 15 is rotatably mounted and has wheel carrying arms 16 at its opposite ends which extend rearwardly and upwardly from the axle. The axle 15 is journaled in a suitable bracket 17 attached to the casing 1. A coil spring 18 is mounted on the axle 15 and has one end attached to the casing and the other end attached to the axle, the spring 18 tending to turn the axle 15 in the direction to swing the arms 16 upwardly and lower the nozzle 6 with respect to the supporting wheels.

One of the arms 16 is provided with a treadle extension 19 and with a ratchet segment 20, both rigidly attached thereto. By pressing downwardly on the treadle 19 the nozzle 6 is lifted. Upon release of the treadle, the nozzle 6 will move downwardly by gravity until stopped by an automatically actuated locking device which will be hereinafter described. The downward movement of the nozzle is retarded by suitable means such as a dashpot interposed between the crank shaft and casing. The dashpot includes a cylinder 21 positioned rearwardly of the wheel carrying axle and attached to the casing 1 in a substantially horizontal position with its forward open end toward the axle, and a piston 22 which carries a suitable sealing element 23 which serves to prevent leakage of air past the piston during its forward movement in the cylinder. A connecting rod 24 is connected at one end to the piston 22 by a wrist pin 25, and at its opposite end by a pivot pin 26 to the ratchet segment 20. The cylinder has a head 27 at its rear end which is provided with an outlet passage 28 which is controlled by ball check valve 29 and also with an air inlet passage 30 which is controlled by an adjustable needle valve 31. When the treadle 19 is pressed downwardly the nozzle 6 is lifted and the piston 22 is moved rearwardly in the cylinder 21 toward the head 27. During this movement of the piston air within the cylinder escapes freely through the outlet passage 28, the pressure of the air forcing the ball 29 from its seat. During the downward movement of the nozzle by gravity, the piston 22 moves forwardly within the cylinder 21. During this movement, entry of air through the passage 28 is prevented by the check valve 29. The inlet passage 30 permits entry of air into the cylinder during forward movement of the piston but this passage is restricted by the needle valve 31 so that air is admitted slowly and the downward movement of the nozzle is retarded. By adjusting the needle valve 31 the cross sectional area of the inlet passage may be increased or decreased as desired to vary the rate at which the nozzle is allowed to move downwardly by gravity.

In adjusting the nozzle 6 to the proper position for operation, the nozzle is lifted after starting the driving motor and is allowed to drop by gravity toward the surface to be cleaned, and means is provided for automatically stopping the downward movement of the nozzle at the most effective position for the cleaning operation. The means for arresting the downward movement of the nozzle is preferably controlled by the pressure of air within the suction nozzle in such manner as to lock the nozzle to its support when the nozzle reaches the position at which the carpet is drawn against the opening of the suction nozzle.

In the device herein shown the rear wall 8 of the suction nozzle is provided with a circular opening 32 which is covered by a flexible diaphragm 33 formed of leather, rubber, or suitably treated fabric. The diaphragm 33 is quite flexible and is impervious to air, so that atmospheric pressure exerted upon the exterior thereof is effective to press the same inwardly when a sub-atmospheric pressure is established within the nozzle 6. The diaphragm 33 is so formed as to provide the central portion thereof with a suitable range of inward and outward movement with respect to the nozzle wall, and this diaphragm may be secured to the nozzle wall by means of a clamping ring 34 held in place by screws. A grooved actuating member 35 is secured to the outer side of the diaphragm 33 at the center thereof, suitable means such as a screw 37 being employed to clamp the actuating member 35 to the diaphragm. The grooved member 35 is engaged by a forked arm 38 which is carried by a shaft 39 supported in brackets 40, which may be formed integrally with the diaphragm clamping ring 34. A coil spring 41 is provided on the shaft 39, the spring 41 having one end attached to a pawl 42 attached to or integral with the arm 38 and the opposite end

attached to a bracket 40, the spring 41 being tensioned in a direction to normally move the forked end of the arm 38 outwardly and to hold the diaphragm in an outwardly bowed position with respect to the nozzle wall 8. The pawl 42 is normally held by the spring 41 in a position clear of the ratchet segment 20, but, upon inward actuation of the diaphragm due to a reduction of air pressure within the nozzle, the pawl 42 is swung downwardly into engagement with the teeth of the ratchet segment 20 to lock the axle against angular movement with respect to the casing and to hold the nozzle at a fixed elevation with respect to the supporting wheels. If desired, a treadle arm 43 may be provided on the pawl 42 by which the pawl 42 may be disengaged from the ratchet segment if desired. By releasing the pawl 42 the nozzle 6 may be permitted to drop by gravity into engagement with the floor should the operator desire to so operate the cleaner.

When it is desired to adjust the nozzle for operation on a particular carpet or floor surface, the operator, after starting the motor, will press the treadle 19 downwardly to lift the nozzle 6. Upon release of the treadle the nozzle 6 will move downwardly by gravity, retarded by the dashpot connected through the rod 24 to the ratchet segment 20. The nozzle 6 is thus allowed to move slowly downwardly toward the floor surface. As the open bottom of the nozzle approaches the surface of a carpet on the floor, the suction of the nozzle will draw the carpet upwardly away from the floor surface and against the end of the nozzle 6, impeding the flow of air through the nozzle so that the air pressure within the nozzle is materially reduced. Upon the reduction of air pressure within the nozzle, the atmospheric pressure acting upon the exterior surface of the diaphragm 33 presses the diaphragm inwardly and rocks the forked arm 38 inwardly, turning the shaft in a direction to move the pawl 33 downwardly into engagement with the teeth of the ratchet segment. The nozzle is thus instantly locked in the position at which the carpet is drawn against the nozzle opening and will be held in this position by the pawl until the pawl is released by means of the treadle 43 or until the nozzle is elevated to a position clear of the floor by depressing the treadle 19. The angle of the ratchet teeth with respect to the pawl 32 is such that the pressure of the teeth against the pawl due to the action of the spring 18 is sufficient to retain the pawl in engagement with the ratchet until the pawl is positively released by the action of one of the treadles 19 or 43. The stopping of the motor will not release the pawl since it is positively retained by the action of the spring 18, so that after the nozzle is once adjusted it will remain in the position in which it is adjusted until it is desired to make a new adjustment, which may be done at any time by actuation of the treadle 19. By reason of the fact that the only work required of the diaphragm 33 is to move a latch, detent, pawl or the like, into engaging position with respect to coacting locking members, this diaphragm may be quite small and may be made of relatively light material. The automatic locking of the nozzle during downward movement upon engagement of the carpet with the nozzle provides an adjustment of the nozzle to a position somewhat below the maximum height to which the carpet can be lifted by the particular nozzle employed, so that the upward force exerted upon the carpet by suction is sufficient to maintain effective engagement of the nozzle with the carpet during passage of the cleaner over the carpet.

In the modification of the invention above described, the lowering of the suction nozzle is controlled by a dashpot. However, the invention may be applied to suction nozzles provided with raising and lowering means of other types, such, for example, as those disclosed in my Patents 2,079,293 granted May 4, 1937, and 2,172,911 granted September 12, 1939, in which the downward movement of the nozzle is controlled by a ratchet and detent mechanism which permits the nozzle to move downwardly by gravity a short distance upon each actuation of the detent.

In Figs. 7 and 8 of the drawings there is illustrated a raising and lowering device similar to that shown in my above mentioned prior patents. In this modification of the invention the ratchet segment 19 above described is replaced by a ratchet segment 45 which is provided with an arcuate slot 46 and which has internal ratchet teeth 47 formed along the outer edge of the slot 46 and external ratchet teeth 48 formed along the inner edge of the arcuate slot 46. The segment 45 has a treadle extension 49, by means of which the supporting arms of the crank shaft may be swung downwardly to raise the suction nozzle. The lowering of the suction nozzle is controlled by a detent treadle 50 which is slidably mounted in the channel guide 51 which may be mounted on the axle supporting bracket 17, the open side of the channel being closely adjacent the inner face of the ratchet segment 45. A coil spring 52 engages the lower end of the treadle 50 and exerts an upward thrust thereon. The treadle 50 carries an outwardly projecting detent member 53 which projects into the arcuate slot 46, the detent member 53 having upper teeth 54 which are engageable with the internal ratchet teeth 47, and lower teeth 55 which are engageable with the ratchet teeth 48. When the treadle 50 is pressed downwardly the teeth 54 are moved out of engagement with the internal ratchet teeth 47 and the suction head drops by gravity until stopped by the engagement of the lower teeth 55 of the detent member with the ratchet teeth 48. The teeth 47 and 48 of the ratchet segment 45 are so disposed with respect to the teeth of the detent 53 that a predetermined angular movement of the ratchet segment is permitted upon movement of the detent member 53 out of engagement with the ratchet teeth 47 and into engagement with the ratchet teeth 48. Upon release of the detent treadle 50, the spring 52 forces the treadle upwardly, carrying the teeth 54 of the detent into engagement with the upper ratchet teeth 48 of the segment 45. This movement of the detent also permits a predetermined angular movement of the ratchet segment and a predetermined downward movement of the suction nozzle 6. By repeated actuations of the treadle 50 the suction nozzle may be lowered as far as desired.

The automatic control of the present invention acts upon a separate pawl 56 which engages with the teeth 48 of the ratchet segment to lock the segment independently of the detent member 53. The pawl 56 is carried by a shaft 57, which may be mounted in the axle supporting bracket. A coil spring 58 on the shaft 57 which acts upon the pawl in a direction to hold the same out of engagement with the ratchet teeth 48. A treadle arm 59 attached to the pawl 56 provides means by which the pawl 56 may be lifted to re-

lease the segment whenever desired. The pawl 56 is controlled by means of the diaphragm 33, the arm 38 actuated by the diaphragm having an arm 60 attached thereto which is engageable with the treadle arm 59 to swing the same rearwardly and force the pawl 56 into engagement with ratchet teeth 48 upon actuation of the diaphragm. The front face of the arm 59 is preferably provided with a stop lug 61 which engages with the outer end of the diaphragm actuated arm 60 to limit the forward movement of the arms 59 and 60.

Whenever the air pressure within the nozzle is decreased by engagement of the carpet with the open end of the nozzle, the diaphragm 35 is drawn inwardly and the arm 60 is swung rearwardly, moving the treadle arm 59 upwardly and rearwardly and swinging the pawl 56 downwardly into engagement with the teeth 48 of the ratchet segment to lock the segment against angular movement with respect to the casing. As in the modification first described, the pawl and ratchet teeth are so arranged that the pawl once engaged with the ratchets remains in engagement with the ratchet regardless of the position of the diaphragm 33, the nozzle being locked in position until the pawl 56 is released either by actuation of the treadle 49 or the treadle 59, so that when adjustment of the suction nozzle is once made the nozzle remains at that adjustment until it is released by manual actuation of one of the treadles for the purpose of readjustment.

Figs. 10 to 13 of the drawings illustrate a modification of the invention in which the adjustment of the nozzle with respect to the floor is automatically effective when the cleaner motor is started and in which the nozzle is automatically readjusted whenever contact between the suction nozzle and the carpet is broken. In this modification of the invention the supporting wheels 14 are carried by a crank axle 62 rotatably mounted in the bracket 17, which has forwardly extending arms 63 upon which the wheels are mounted. A coil spring 64 is mounted on the axle and has one end attached to the casing and the other engaging an arm 65 fixed to the axle. The spring 64 serves as a counterbalance for the nozzle, acting in a direction to move the wheel carrying arms downwardly and having sufficient strength to lift the nozzle and hold it in elevated position. One of the wheel carrying arms carries a ratchet segment 66 and this segment may be provided with a rearwardly extending treadle extension 67, by means of which the segment 66 may be elevated and the nozzle 6 moved downwardly in opposition to the spring 64. The nozzle 6 is provided with a diaphragm 33 which is normally held in its rearmost position by a spring 41 acting upon an actuating arm 38 as in the modifications previously described. The arm 38 has a pawl 68 attached thereto which is engagable with the teeth of the ratchet segment 66 to limit the downward movement of the nozzle.

The nozzle 6 is normally held in an elevated position by the counterbalance spring 64 and suitable means is provided for moving the nozzle downwardly in opposition to the spring 64. The nozzle lowering means may be a solenoid 69, which has an armature 70 which also serves as a piston in a dashpot cylinder 71 which is mounted within the solenoid. The cylinder 71 is formed of a suitable non-magnetic metal such as copper or brass, and the combined armature and piston 70 is preferably constructed with a laminated iron core and may have an outer shell of non-magnetic metal such as copper or brass.

The combined armature and piston 70 is connected by a link 72 to the ratchet segment 66. The solenoid 69 is disposed rearwardly of and above the crank 62 with its axis substantially horizontal, so that when it is energized the armature 70 moves rearwardly and the ratchet segment 66 is swung upwardly to raise the wheels 14 and lower the nozzle 6. The combined armature and piston 70 is loosely fitted in the cylinder and is provided with a cup packing 73 which allows free passage of air between the cylinder and piston during the forward movement of the piston, but which seals the space between the piston and cylinder during rearward movement of the piston. The cylinder 71 has a head 74 provided with an air outlet passage 75 controlled by an adjustable needle valve 76. When the solenoid 69 is energized the combined armature and piston 70 move rearwardly in the cylinder, compressing the air within the cylinder between the piston and the head 74. The air so compressed escapes slowly through the needle valve controlled outlet passage. The air trapped within the cylinder 71 during rearward movement of the piston retards the movement of the piston so that the nozzle 6 is lowered slowly upon energization of the solenoid.

As shown in Fig. 13 of the drawings, the fan driving motor M is controlled by a manually operable switch 77 which may be of any suitable construction and mounted on a convenient part of the suction cleaner for actuation manually to start or stop the motor. The solenoid 69 is connected in parallel with the motor so that it will be deenergized whenever the motor circuit is opened by means of the switch 77, the solenoid circuit being controlled by a second switch 78 which serves to energize or deenergize the solenoid when the motor is operating. The solenoid switch 78 consists of upper and lower horizontally disposed spring contact arms 79 and 80 which are secured at their rear ends to the axle bearing bracket 17. The arms 79 and 80 are suitably insulated from each other at their attached ends and their free ends are normally out of contact. The ratchet segment 66 carries a laterally projecting pin 81 which engages with the upper spring arm 79 of the solenoid switch as the segment 66 approaches its lowermost position and the nozzle 6 its uppermost position. Engagement of the pin 81 with the spring arm 79 closes the solenoid switch 78 and energizes the solenoid 69 if the motor controlling switch 77 is closed. A locking arm 82 attached to the pawl 68 extends downwardly to a position such that its lower end engages the outer end of the arm 79 when the arm 79 is in elevated position, the lower end of the locking arm 82 being urged rearwardly by the spring 41. When the arm 79 is moved downwardly to engaging position by the pin 81, the outer end of the arm 79 moves below the lower end of the arm 82, whereupon the arm 82 is moved rearwardly by the spring 41 to position its lower end over the outer end of the arm 79 and lock the solenoid switch in closed position. A stop 83 may be provided on the nozzle 6, with which the segment 66 engages to limit the downward movement of the segment and the upward movement of the nozzle 6.

When the fan driving motor M is deenergized the diaphragm 33 will be deflected rearwardly by the spring 41 acting through the arm 38. The pawl 68 will be moved to releasing position and

the nozzle 6 will be moved to its uppermost position by the counterbalance spring 64. The stop pin 81 will then be in engagement with the upper arm 79 of the solenoid switch and the locking arm 82 will be in locking position. Upon closing the main switch 77, the solenoid 69 is energized and the ratchet segment 66 is moved upwardly to raise the wheels 14 and lower the nozzle 6, the solenoid switch 78 being held in closed position by the locking arm 82. The downward movement of the nozzle will be retarded by the dashpot and the nozzle will move downwardly until the suction of the nozzle draws the carpet against the nozzle opening, whereupon the decrease in pressure within the nozzle will cause the diaphragm 33 to be forced inwardly, withdrawing the locking arm 82 from engagement with the switch arm 79 and allowing the switch 78 to open and deenergize the solenoid 69. At the same time the pawl 68 is engaged with the teeth of the ratchet segment 66 to lock the nozzle 6 in position. If at any time during operation of the cleaner the nozzle should be disengaged from the carpet, the pressure within the nozzle will be increased, allowing the diaphragm 33 to be deflected rearwardly by the spring 41, thereby releasing the pawl 68 so that the wheel carrying arms can be swung downwardly by the spring 64. The nozzle 6 is quickly moved to its uppermost position by the spring 64, in which position the switch arm 79 is engaged by the pin 81 and moved to closed position and past the lower end of the locking arm 82. The closing of the solenoid circuit starts the downward movement of the nozzle and the locking arm 82 holds the solenoid switch in closed position. Upon reengagement of the nozzle with the carpet, the solenoid is deenergized and the nozzle is automatically locked in position by engagement of the pawl 63 with the ratchet segment 66 as above described. The device just described is therefore effective to automatically adjust the nozzle to the proper height for cleaning whenever the fan operating motor is started and is also operative to automatically readjust the nozzle whenever the connection between the nozzle and the carpet is broken. If the operator desires the nozzle to be pressed tightly against the floor surface being cleaned, the nozzle can be moved downwardly at any time by pressing on the treadle 67. Whenever the operator desires to effect a readjustment of the suction nozzle, such readjustment is obtained by simply opening and closing the motor controlling switch 77.

The principles of the present invention may be utilized in various ways, numerous modifications and alterations being contemplated, substitution of parts and changes in construction being resorted to as desired, it being understood that the embodiments shown in the drawings and described above are given merely for purposes of explanation and illustration without intending to limit the scope of the claims to the specific details disclosed.

What I claim is:

1. In a portable suction cleaner, a suction nozzle having an opening along its bottom, a wheeled support for said nozzle, suction creating means connected to said nozzle to draw air through said opening, means for lifting said nozzle, means for retarding the downward movement of the nozzle, and means controlled by the air pressure within the nozzle for arresting the downward movement of the nozzle when a predetermined desired suction exists within the nozzle.

2. In a portable suction cleaner, a wheeled support, a nozzle mounted for vertical movement upon said support, suction creating means connected to the nozzle, nozzle counterbalancing means acting upon said nozzle to move the same upwardly, means for lowering said nozzle in opposition to said counterbalancing means, and means controlled by the air pressure within the nozzle for rendering said lowering means inoperative and locking the nozzle against upward movement when a predetermined desired suction exists within the nozzle.

3. In a portable suction cleaner, a wheeled support, a nozzle mounted for vertical movement upon said support, suction creating means connected to the nozzle, nozzle counterbalancing means acting upon said nozzle to move the same upwardly, means for lowering said nozzle in opposition to said counterbalancing means, means for retarding the downward movement of the nozzle, and means controlled by the air pressure within the nozzle for rendering said lowering means inoperative and locking the nozzle against upward movement when a predetermined desired suction exists within the nozzle.

4. In a portable suction cleaner, a wheeled support, a nozzle mounted for vertical movement upon said support, suction creating means connected to the nozzle, nozzle counterbalancing means acting upon said nozzle to move the same upwardly, means for lowering said nozzle in opposition to said counterbalancing means, manually operable means for controlling the operation of said lowering means, a pressure actuated member connected to said nozzle, means controlled by said member for locking said nozzle against vertical movement when a predetermined desired suction exists in the nozzle, and means controlled by said member for rendering said lowering means inoperative.

5. In a portable suction cleaner, a wheeled support, a nozzle mounted for vertical movement upon said support, suction creating means connected to the nozzle, nozzle counterbalancing means acting upon said nozzle to move the same upwardly, an electric motor for operating said suction creating means, a manually operable switch controlling the circuit of said motor, a solenoid in the motor circuit connected in parallel with the motor and operatively connected to said nozzle to move the same downwardly in opposition to said counterbalancing means, means for retarding the downward movement of the nozzle, a switch for controlling said solenoid independently of said motor, locking means for holding said nozzle against vertical movement, and means movable in response to variations in the air pressure within the nozzle for controlling said locking means and solenoid switch to arrest the downward movement of the nozzle when a predetermined desired suction exists in the nozzle.

6. In a portable suction cleaner, a wheeled support, a nozzle mounted for vertical movement upon said support, suction creating means connected to the nozzle, means for elevating said nozzle means including a solenoid for moving said nozzle downwardly, means connected to said nozzle for retarding downward movement thereof, means for locking said nozzle in various positions of vertical adjustment, and means controlled by the air pressure within the nozzle for controlling said solenoid and locking means to arrest the downward movement of the nozzle

when a predetermined desired suction exists in the nozzle.

7. In a portable suction cleaner, a wheeled support, a nozzle mounted for vertical movement upon said support, suction creating means connected to the nozzle, means for elevating said nozzle a solenoid operatively connected to said nozzle for imparting a downward movement thereto, a switch controlling said solenoid, and means responsive to variations in the air pressure within said nozzle for controlling said switch to de-energize the solenoid when a predetermined desired suction exists in the nozzle.

8. In a portable suction cleaner, a wheeled support, a nozzle mounted for vertical movement upon said support, suction creating means connected to the nozzle, means for retarding downward movement of said nozzle, means for locking the nozzle in adjusted positions with respect to said support, means controlled by the air pressure within said nozzle for operating said locking means to lock the nozzle when a predetermined desired suction exists within the nozzle, and means operable upon release of said locking means for automatically moving the nozzle to its uppermost position.

9. In a portable suction cleaner, a wheeled support, a nozzle mounted for vertical movement upon said support, suction creating means connected to the nozzle, an electric motor for driving said suction creating means, a switch controlling said motor, means for lifting said nozzle and for normally holding the same in elevated position, means controlled by said switch for lowering the nozzle when said switch is closed, and means controlled by the air pressure within the nozzle for locking the nozzle in operating position when a predetermined desired suction exists within the nozzle.

10. In a portable suction cleaner, a wheeled support, a nozzle mounted for vertical movement upon said support, suction creating means connected to the nozzle, an electric motor for driving said suction creating means, a switch controlling said motor, means for lifting said nozzle and for normally holding the same in elevated position, means controlled by said switch for lowering the nozzle when said switch is closed, means for retarding the downward movement of the nozzle, and means controlled by the air pressure within the nozzle for locking the nozzle in operating position when a predetermined desired suction exists within the nozzle.

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