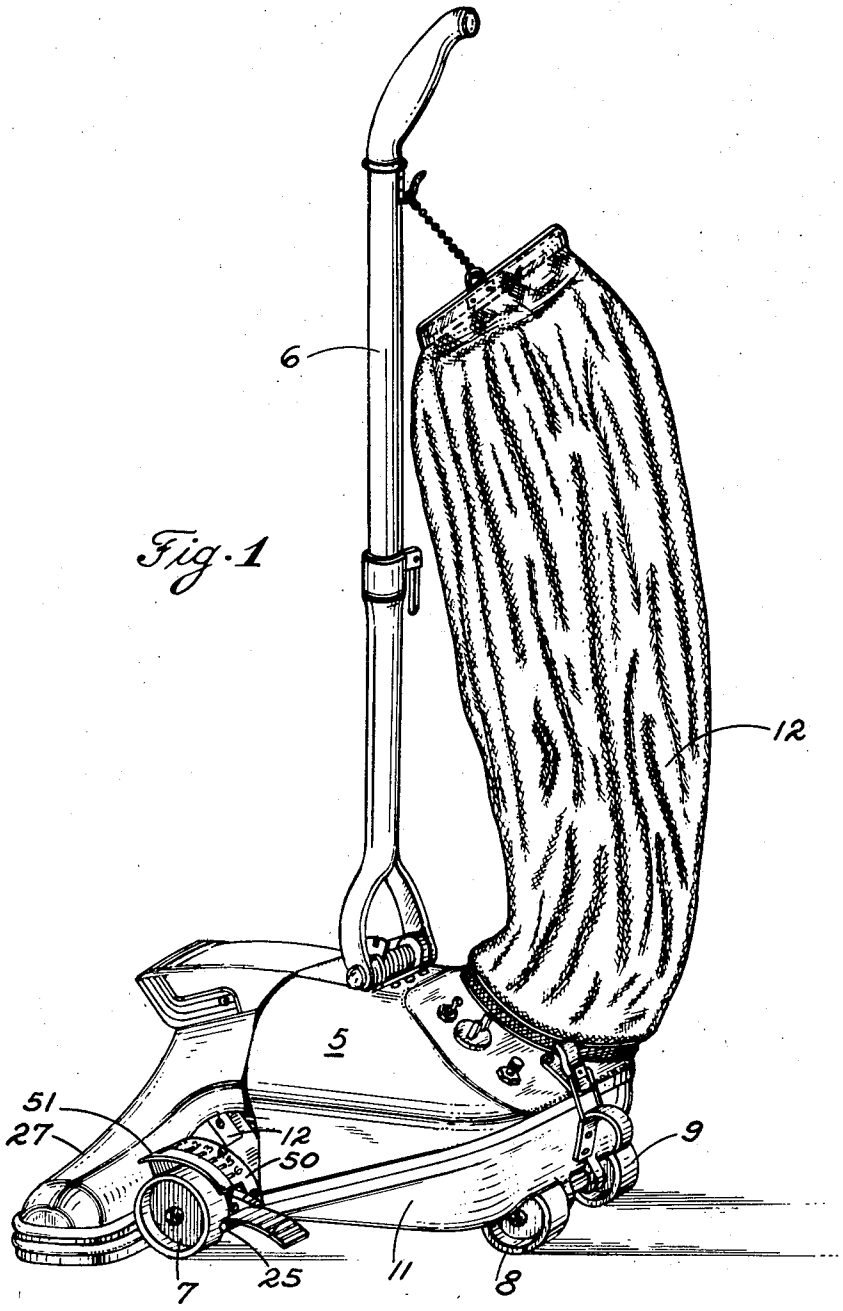
Feb. 18, 1958 J. B. KIRBY 2,823,412

VACUUM CLEANER NOZZLE ADJUSTMENT

Filed Aug. 31, 1953 4 Sheets-Sheet 1

Fig. 1



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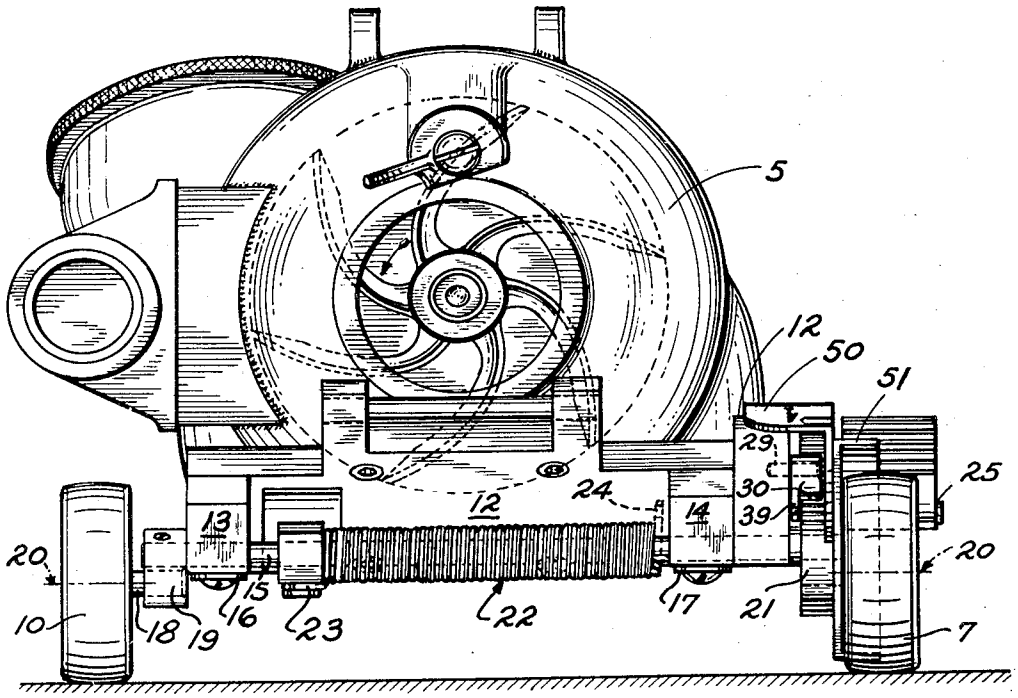

Fig. 2

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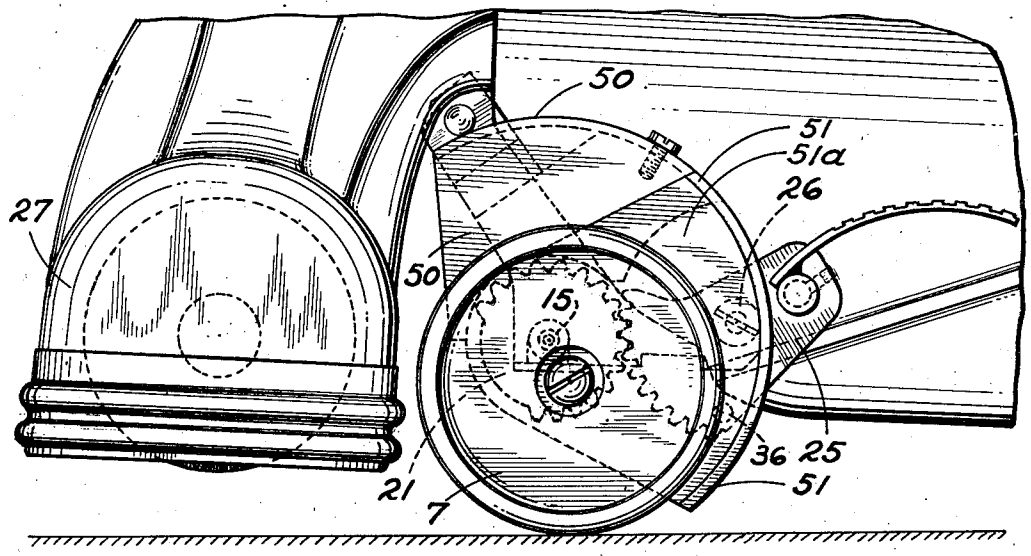

Fig. 3

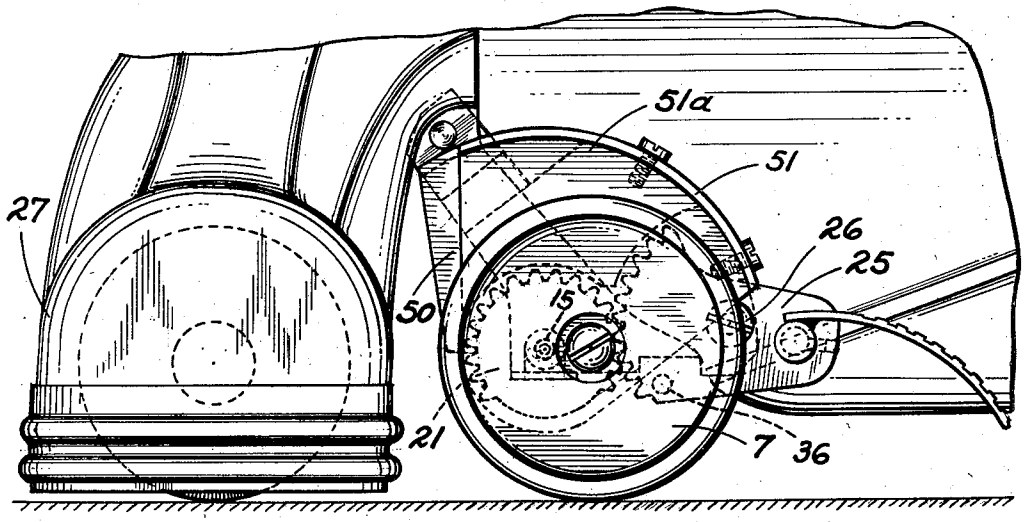

Fig. 4

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VACUUM CLEANER NOZZLE ADJUSTMENT

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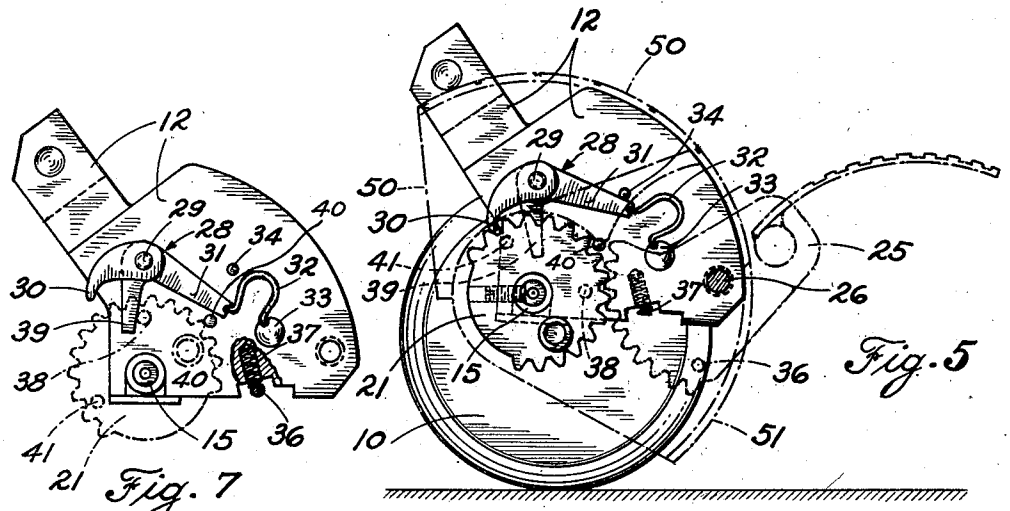

Fig. 5

Fig. 7

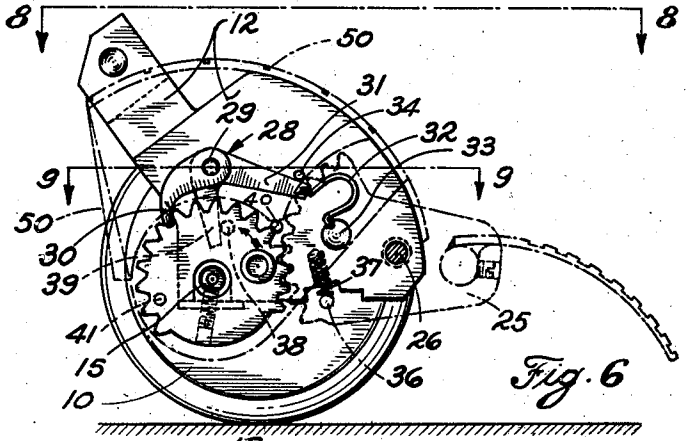

Fig. 6

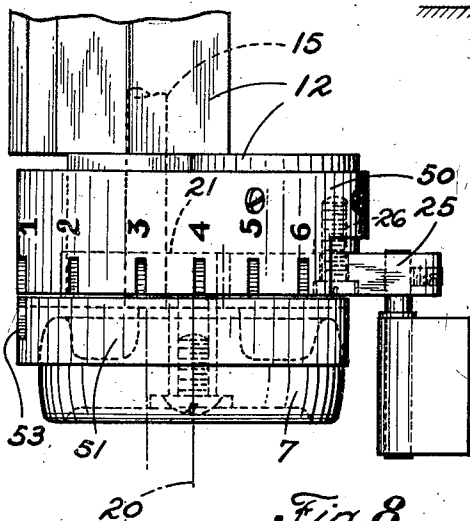

Fig. 8

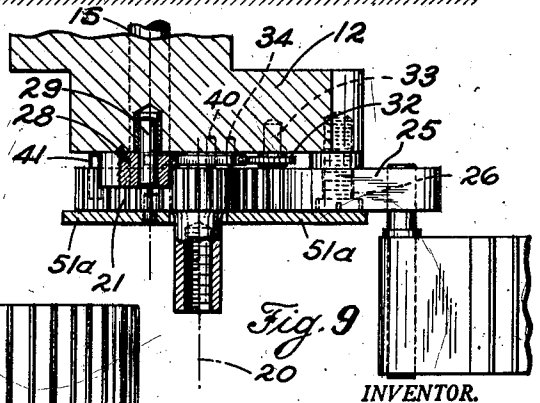

Fig. 9

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VACUUM CLEANER NOZZLE ADJUSTMENT

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Application August 31, 1953, Serial No. 377,481

5 Claims. (Cl. 15—354)

In vacuum cleaners of the floor cleaner type embodying a nozzle containing a rotating brush, the most efficient cleaning operation, with the minimum of wear on the carpet, is obtained when the suction holds the carpet off the floor in sealing engagement with the nozzle and in contact with the brush. In order to obtain this operation in a cleaner of general utility it is necessary that the nozzle be adjustable with respect to the supporting surface.

The present invention provides a nozzle adjustment for a vacuum cleaner of this type in which the nozzle is normally urged to its uppermost position with respect to the supporting surface and may be simply and easily lowered by the operator until the carpet is lifted from the floor by the suction into sealing engagement with the nozzle. The sealing of the carpet against the mouth of the nozzle produces a distinct change in the sound of the air entering the nozzle and, at the same time, the sound of the rotating brush engaging the carpet becomes audible, thus providing a distinct signal to the operator that the nozzle has been lowered the proper amount for most efficient operation.

According to the present invention the nozzle is automatically latched in the desired adjusted position after it has been lowered to the correct point. A single control member, or pedal, is provided which can be easily pressed down causing proportionate downward movement of the nozzle to the correct position. The control member is then released by the operator, the nozzle remaining in the selected position. When the single control member, or pedal, is pushed to its extreme lower position the latching means is released and the nozzle returns to its uppermost position, at which point the latching means again becomes operative.

Further features, objects and advantages of the present invention will appear from the following description in the appended drawings wherein

Fig. 1 is a perspective view of the cleaner in its entirety, showing the nozzle adjustment provided at one side of the cleaner body;

Fig. 2 is an end elevation taken from the front of the cleaner with the floor nozzle and rear wheels omitted showing the nozzle adjustment mechanism;

Fig. 3 is an enlarged side elevation showing parts of the nozzle adjusting mechanism in phantom outline with the nozzle at a high position with respect to the surface to be cleaned;

Fig. 4 is a view similar to Fig. 3 showing the nozzle in a lowered position;

Fig. 5 is an elevation of the adjusting mechanism similar to Fig. 3 but with the nozzle removed and showing details of the holding pawl;

Fig. 6 is a view similar to Fig. 4 with parts removed to illustrate the position of the mechanism as the nozzle approaches its lowermost position;

Fig. 7 is an elevation with parts broken away to show the pawl release operation as the nozzle reaches its lowermost limit;

Fig. 8 is a plan view taken on the plane 8—8 of Fig. 6 showing the indicia employed on relatively moving parts to indicate the nozzle adjustment; and

Fig. 9 is a sectional view taken on the plane 9—9 of Fig. 6.

The vacuum cleaner illustrated in Fig. 1 is of the type known as a floor cleaner, in that the cleaner body **5** is propelled over the surface to be cleaned by means of the handle **6** and is supported by floor engaging wheels **7**, **8**, **9** and **10**. The floor cleaner illustrated incudes a removable body section **11** which is in the form of a scoop and facilitates the removal of the dirt and lint which may be collected in the dust bag **12**. The details of the floor cleaner construction are disclosed and claimed in my copending application Serial No. 363,311, filed June 22, 1953. It will be understood as this description proceeds that the nozzle adjusting mechanism of the instant application is well suited to numerous types of vacuum cleaners.

The nozzle adjustment mechanism is secured to the forward underside of the cleaner body as best illustrated in Fig. 2 and comprises a block **12** extending transversely of the cleaner and having a depending bearing block **13** at the left end thereof and a depending bearing block **14** at the right thereof. The underside of each of the bearing blocks **13** and **14** is recessed to receive a transverse wheel connecting shaft **15**. The shaft **15** is rotatably mounted in the bearing blocks and is retained in the recess by plates **16** and **17** which are secured to the underside of the bearing blocks. The wheel **10** is rotatably mounted on an axle shaft **18** eccentricaly of the wheel connecting shaft **15** by the eccentric block **19**. The wheel **7** is similarly mounted for rotation about the axis indicated at **20** by the member **21** fixed to the right hand end of the shaft **15**. This arrangement provides that the supporting wheels **7** and **10** swing in unison about the axis of the shaft **15** and thus raise and lower the nozzle depending upon the displacement of the wheel axis from the horizontal plane of the axis through the shaft **15**. A spring **22** is coiled about the shaft **15** and is anchored at one end to the shaft by the adjustable collar **23**, which may be turned to a desired position and tightened on the shaft to adjust the tension of the spring. The other end of the spring, as at **24**, is brought into engagement with the block **12** and the spring is wound and biased so as to normally turn the shaft **15** in a clockwise direction as viewed in Figs. 3, 4, 5 and 6. Thus the spring is wound so as to swing the shaft **15** about its axis and raise the nozzle to its maximum height with respect to the floor in the absence of any means restraining such turning movement.

Referring to Fig. 3, the member **21** which carries the wheel **7** eccentric of the shaft **15**, is provided with a sector of gear teeth on a major portion of its periphery. The gear teeth are concentric with respect to the axis **15** and are arranged to interengage or mesh with a sector of gear teeth on the pedal **25** which is pivotally mounted in the block **12** by the pivot pin **26**. The intermeshing gear teeth on the member **21** and the pedal **25** is such that when the pedal is depressed the member **21** is rotated in a counterclockwise direction as shown in Figs. 3 to 6, and the extent to which the pedal is turned or depressed is a function of the nozzle movement. When the pedal is depressed from the position shown in Fig. 3 to the position shown in Fig. 4, the shaft **15** is turned in a counterclockwise direction and the floor nozzle **27** is brought from its high position to its lowermost position. The cleaner body pivots about the rear wheels **8** and **9** as the front wheels **7** and **10** are raised or lowered so that the nozzle, which is located in front of the front wheels, is raised and lowered through a slightly greater distance than the front wheels. The mechanical advantage of the

pedal is preferably, as in the illustrated embodiments, sufficiently great so that the free end of the pedal travels through a substantially greater distance than the cleaner nozzle, thereby permitting accurate and easy control of the nozzle position.

It is desirable to provide the end of the pedal **25** with a substantial mechanical advantage with respect to the vertical movement of the nozzle, since the total required nozzle movement is relatively small, and a substantially greater total pedal movement is needed to provide easy and accurate control by the operator's foot. At the same time, the angle through which the pedal turns about its pivot **26** must be kept small so that the upper surface of the pedal is always in position to be easily engaged by the foot. Likewise, it is desirable to turn the axle **15** through a relatively large angle in order to facilitate latching the nozzle in a sufficient number of adjusted positions and also provide an easily read indicator of the nozzle position as described hereinafter.

All of these antagonisms are reconciled in the preferred embodiment of the invention as illustrated in which the pedal **25** is of substantial length from its pivot **26** while the gear teeth on the pedal are at a greater radius from the pivot **26** than the radius of the gear teeth on the member **21** from the axle **15**. At the same time the axes **20** of the wheels **7** and **10** are offset a relatively small distance from the axis of the shaft **15**, so that the vertical component of the movement of the wheels with respect to the cleaner body is small compared to the travel of the free end of the foot pedal.

To hold the member **21** and the shaft **15** in any of its adjusted positions against the urging of the spring **22**, a ratchet including member **21** as a ratchet wheel cooperable with a pivoted spring-pressed pawl **28** is provided. The pawl is pivoted as at **29** to the block **12** and includes a portion **30** adapted to engage the gear teeth on the periphery of the member **21**. The pawl also includes a portion **31** which is notched at its free end to receive one end of a U-shaped spring **32**. The other end of the U-shaped spring rests in a notch in a pin **33** carried by the block **12**. The tendency of the spring **32** to expand normally urges the portion **30** of the pawl to engage the gear teeth on the periphery of the member **21**. A stop pin **34** limits the swinging of the pawl in one direction in response to the action of the spring **32**. The pin **34** is also anchored in the block **12** (see Fig. 9). Thus it will be understood that as the pedal **25** is depressed, such depression may be arrested at any point and that upon release of the foot treadle by the operator, the pawl **28** will hold the member **21** against rotation in response to the spring **22**. Thus the operator may progressively lower the cleaner nozzle toward the surface to be cleaned by depressing the pedal. When the desired cleaning position is obtained, foot pressure on the treadle is removed and the nozzle remains in its adjusted position. It will be understood by those skilled in the art that for thick deep pile rugs the nozzle will not be lowered to the maximum extent as shown in Fig. 4.

When it is desired to raise the nozzle **27** from any predetermined lower position, the foot treadle is depressed to its maximum extent. Fig. 6 shows the relation of the nozzle adjustment parts as this maximum lowered position is approached. The approach to this maximum lowered position is indicated to the operator by slightly increased resistance to pedal depression. The increased resistance to pedal depression is effected by bringing the transverse pin **36** carried by the pedal **25** into engagement with a coil spring **37** carried by the block **12**. By reference to Figs. 6 and 7 it will be noted that the pin **36** compresses the spring **37** as the limit of the pedal depression is reached.

Coincident with the limiting downward movement of the pedal **25**, a pin **38** carried by the member **21** is brought into engagement with a depending arm **38** integrally formed on the pawl **28**. The pin **38** extends from

the face of the member **21** and the pin **38** is effective to tilt the pawl **28** in a clockwise direction about its pivot **29** (see Fig. 7). This swings the portion **30** of the pawl out of engagement with the teeth on the member **21** and thus the member **21** and the shaft **15** are free to turn in a clockwise direction in response to the spring **22**. As the pawl **28** is rocked to its disengaged position, it rocks the U-shaped spring **32** to an "over center" position so that the spring **32** now tends to hold the pawl in its disengaged position with the portion **31** of the pawl against a stop pin **40** carried by the block **12**. Thus it will be understood that the U-shaped spring **32** operates to bias the pawl into either of two positions—one being the engaged position with the portion **30** engaging the teeth on member **21** (Figs. 5 and 6), and the other being the disengaged position with the portion **31** of the pawl against the stop pin **40**. The pawl remains in such disengaged position as the spring rapidly swings the shaft **15** in a clockwise direction and raises the nozzle to its high position. As the nozzle approaches its uppermost position, the pin **41** engages the arm **39** of the pawl and snaps the pawl over "dead-center" to its engaged position. It will be noted that the pin **38** carried by the member **21** throws the pawl to disengaged position and the pin **41** carried by the member **21** throws the pawl to its engaged position. At the limit of the depressing movement on the pedal **25** the pawl is disengaged and the pin **41** limits upward movement of the nozzle.

The spring **32** functions not only to hold the pawl **28** in engaged position as illustrated in Fig. 6 and disengaged position as illustrated in Fig. 7, but also functions as a pawl spring so as to permit the gear teeth on the member **21** to ratchet past the end of the pawl during downward movement of the pedal and consequent counterclockwise rotation of the member **21**. In the illustrated arrangement, when the pawl is in its engaged position, as illustrated in Figs. 5 and 6, a line connecting the axis of the pivot **29** with the notch in the pin **33** passes below the spring receiving notch in the end of the arm **31** of the pawl. Thus the force exerted by the spring **32** acts in a direction to rock the pawl in a counterclockwise direction so as to hold the portion **30** in position between two adjacent gear teeth on the member **21**. When the member **21** is forced to rotate in a counterclockwise direction by depression of the pedal each succeeding tooth on the member **21** engages the undersurface of the portion **30** of the pawl and rocks the pawl in a clockwise direction about its pivot **29** against the tension of the spring **32**. The height of the teeth on the member **21**, however, is insufficient to rock the pawl far enough in a clockwise direction to bring the notch in the end of the arm **31** below the line connecting the pivot **29** with the notch in the pin **33**. Thus the spring **32** continues to act during this operation to urge the pawl to rotate in a counterclockwise direction and thus return to its engaged position after each succeeding tooth on the member **21** passes the portion **30**.

When the pedal is depressed to its maximum position and against the extra resistance provided by the spring **37**, the pin **38** engaging the arm **39** rocks the pawl far enough in a clockwise direction to bring the notch in the end of the arm **31** below the line connecting the pivot **29** with the notch in the pin **33** so that the force of the spring **32** acts to rotate the pawl in a clockwise direction and hold the portion **30** out of engagement with the teeth on the member **21** as shown in Fig. 7 and remains in this position until the nozzle is permitted to rise to its uppermost position by relaxing the pressure on the pedal at which time the pin **41** engages the arm **39** and swings the arm **31** above the center line position to the position illustrated in Fig. 5.

The spring **22** is preferably wound with sufficient force so as to hold the nozzle in any selected position of adjustment and prevent it from being pulled downwardly

by the suction created by the cleaner and acting through the mouth of the nozzle **27** against the rug or carpet being cleaned. Thus in use, the cleaner with the nozzle in its uppermost position may be pushed onto the carpet to be cleaned and the nozzle then lowered by depression of the foot treadle **25** until the suction acting through the nozzle causes the carpet to rise upwardly from the floor into sealing engagement with the nozzle and in contact with the brush. The sealing of the carpet against the mouth of the nozzle produces a distinct change in the sound of the air entering the nozzle and at the same time the sound of the rotating brush engaging the carpet becomes audible, thus providing an audible signal advising the operator that the nozzle is in the proper position of adjustment for cleaning that particular carpet. The force of the spring **22** holds the nozzle in the selected position against the action of the suction and the weight and pull of the carpet which has now be added to the weight of the cleaner body so that as the cleaner is pushed along the carpet the portion of the carpet under the nozzle is progressively raised from the flood and held in contact with the brush so that air may enter from below the carpet and pass through the entire carpet as well as the nap while the carpet is suspended out of contact with the floor and rapidly agitated by the brush.

In spite of the fact that the spring **22** is thus strong enough to lift and resist not only the weight of the cleaner but the weight and the pull of the carpet and the action of the suction, the nozzle may be readily and easily lowered by depression of the foot treadle because of the mechanical advantage of the treadle with respect to the nozzle and also because of the fact that the foot treadle is pivoted on the cleaner body itself so that the reaction of the pedal on its pivot **26** also acts in a direction to lower the nozzle. Thus the pedal moves downwardly under relatively slight pressure to lower the nozzle to its desired adjusted position and at the same time the nozzle is firmly held against undesired further lowering as a result of the action of the cleaner. To visually indicate to the user the adjusted position of the nozzle, an arcuate plate **50** is mounted on the block **12**. The plate **50** is preferably marked as illustrated in Fig. 8 with a series of numbers 1 to 6 spaced around the outer surface of the plate. A similarly shaped arcuate flange **51** is provided on a flat plate **51*a*** anchored to the member **21** so as to turn therewith about the axis of the rock shaft **15**. The arcuate members **50** and **51** have the center of the shaft **15** as common center and when the member **21** is turned the flange **51** rotates about the center of the shaft **15** relative to the plate **50** which is fixed to the block **12**. The moving member **51** is provided with an indicator or marker as at **53** which is adapted to be brought into alignment with any of the indicia 1 to 6 on the fixed member **50** by pedal movement rocking the member **21** and the plate **51*a***. As illustrated in Fig. 8 the nozzle has been lowered to its lowermost position and when released therefrom as above described, the marker **53** will be moved around by a raising movement of the nozzle so as to be brought into alignment with number 6 or high nozzle position on the plate **50**. It will be understood that the pedal movement can be discontinued at any numbered position between 6 and 1 as the operator is lowering the nozzle. One of the advantages of the visual indication is that the user from experience will learn which of the numbered adjusting positions obtains maximum cleaning efficiency for a particular rug or floor.

The visual indicator is made readily legible by reason of the fact that the gear teeth on the pedal **25** are at a substantially greater radius from the pivot **26** than the radius of the gear teeth on the member **21** from the axis of the shaft **15**. Thus a given angular movement of the pedal about its pivot produces a substantially greater angular movement of the flange **51**, so that the indicia on the flange **50** may be more widely spaced for easier identification of the particular position of the nozzle.

While the preferred embodiment has been described in considerable detail, it will be understood that the invention is not limited thereto and that numerous modifications and rearrangements of the parts may be made without departing from the scope of the invention as defined in the following claims.

What is claimed is:

1. Nozzle adjustment means for a vacuum cleaner body having a downwardly directed nozzle including a transverse shaft journalled to said cleaner, a supporting wheel eccentrically connected to said shaft, a coil spring surrounding said shaft for rotating the same in a direction to raise the nozzle, means limiting the rotation of said shaft, means for adjusting the tension of said spring, a pedal pivoted on the cleaner body and geared to the shaft so that, when the pedal is depressed, it rotates said shaft against the tension of said spring in a direction to lower the nozzle, a releasable pawl for holding said nozzle in a desired adjusted position, and means operated by movement of said pedal to its lowermost position to release said pawl.

2. Nozzle adjusting means for a vacuum cleaner comprising a vacuum cleaner having a transverse floor nozzle, a member secured to said cleaner adjacent the floor nozzle, a wheel shaft pivoted on said member, a supporting wheel mounted eccentric of said wheel shaft at each end of the shaft, a pedal pivoted on the cleaner body, a first gear sector concentric with and fixed to the wheel shaft, a second gear sector meshing with said first gear sector on said pedal concentric with the pivot for the pedal whereby movement of said pedal effects movement of said wheel shaft and moves said supporting wheels toward and away from said cleaner body to lower and raise said floor nozzle.

3. Nozzle adjusting means for a vacuum cleaner comprising a vacuum cleaner body having a transverse floor nozzle, supporting wheels at the rear of the cleaner body, a pair of spaced adjusting wheels at the forward end of the cleaner body, means to move said adjusting wheels in unison about a first axis eccentric of the wheel axes to raise and lower the floor nozzle with respect to a supporting surface, a shaft mounted on the cleaner body for limited rotational movement on said first axis, spring means interposed between said shaft and said body turning said shaft in one direction to elevate said nozzle, a gear sector on said shaft, a pedal pivoted to the cleaner body, a gear sector on the pedal in mesh with the gear sector on said shaft whereby depression of the pedal turns said shaft in a direction opposite to the turning moment of said spring, a spring pressed pawl pivoted on the cleaner body engageable with said last mentioned gear to form a ratchet whereby said shaft is held in adjusted position subsequent to pedal depression.

4. A nozzle adjusting mechanism for a vacuum cleaner comprising an elongated horizontally disposed body, wheel supporting means at the rear of said body, a shaft rotatably mounted transversely on the forward end of said body, said shaft having an eccentric crank portion at each end thereof, supporting wheels pivoted at each eccentric crank portion whereby said last-named wheels are moved in unison toward and away from the cleaner body by rotation of said shaft, spring means interposed between the shaft and the body turning said shaft so as to move said last-named wheels away from the cleaner body and thereby raise the forward end of the cleaner, a pedal pivoted with respect to the cleaner body adjacent said shaft, a gear sector fixed to said shaft concentric therewith, a gear sector carried by said pedal concentric with the pivot for the pedal whereby said shaft is turned in response to pedal depression to

move said last-named wheels toward said body and thereby lower the forward end of the cleaner body, a spring pressed pawl pivoted with respect to the cleaner body adapted to engage said last mentioned gear to form a ratchet and hold the shaft in a position of adjustment determined by the extent of pedal depression.

5. Nozzle adjusting means for a vacuum cleaner comprising a vacuum cleaner body, a transverse wheel shaft, eccentric crank pins at each end of the said wheel shaft, supporting wheels on said crank pins, spring means to turn said wheel shaft in a direction moving said wheels away from said cleaner body, a pedal mounted on the cleaner body, a gear sector fixed concentrically to said wheel shaft, a meshing gear sector carried by the pedal concentrically of the pivot for said pedal, a pawl pivoted with respect to the cleaner body arranged to engage said last mentioned gear to form a ratchet, spring

means biasing said pawl into engagement with said last mentioned gear ratchet, pawl release means carried by the last mentioned gear ratchet to move said pawl out of engagement with said last mentioned gear ratchet after pedal depression has moved said wheel shaft to bring said supporting wheels towards the cleaner body.

References Cited in the file of this patent

UNITED STATES PATENTS

1,995,084	Wiehle	Mar. 19, 1935
2,167,785	Taylor	Aug. 1, 1939
2,178,006	Taylor	Oct. 31, 1939
2,289,711	Kirby	July 14, 1942
2,389,881	White	Nov. 27, 1945
2,600,141	Turner	June 10, 1952