

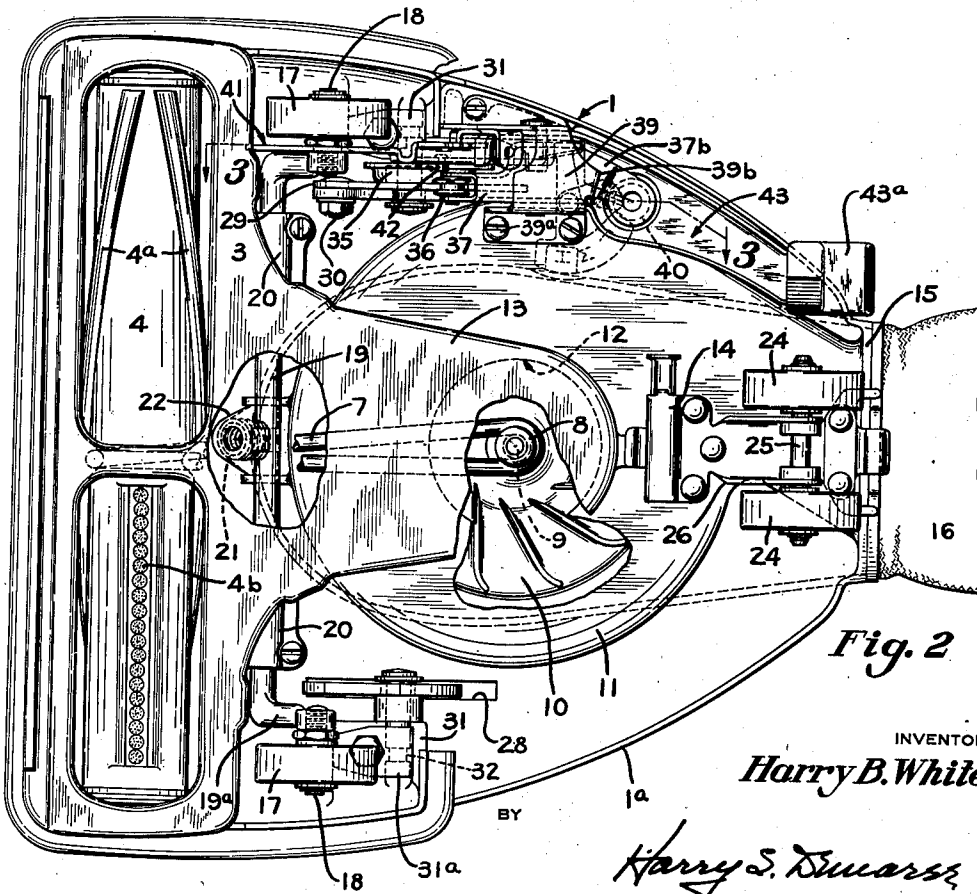
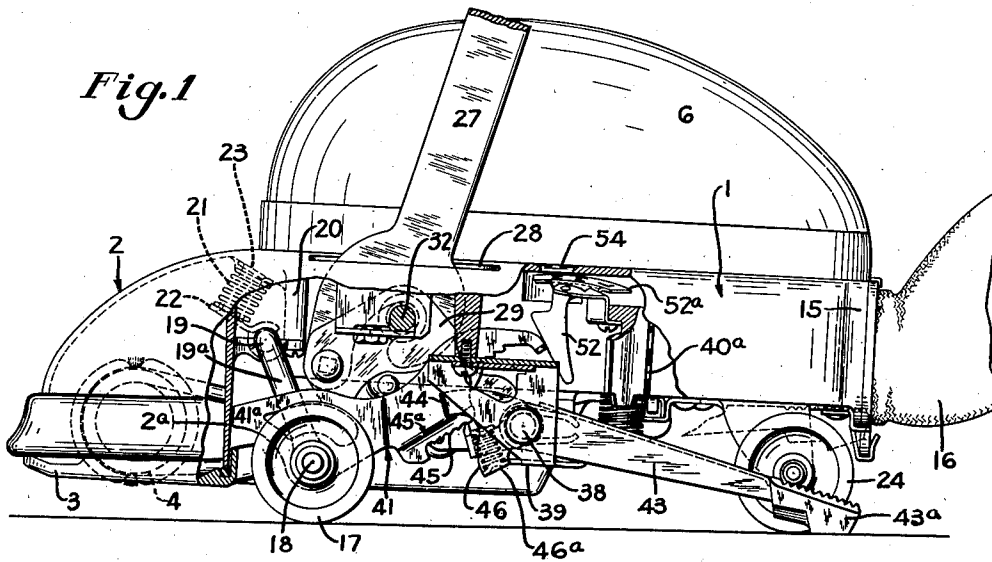
Jan. 30, 1940.

H. B. WHITE
SUCTION CLEANER

2,188,381

Filed April 22, 1936

4 Sheets-Sheet 1



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4 Sheets-Sheet 2



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2,188,381

SUCTION CLEANER

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4 Sheets-Sheet 3

Fig. 5

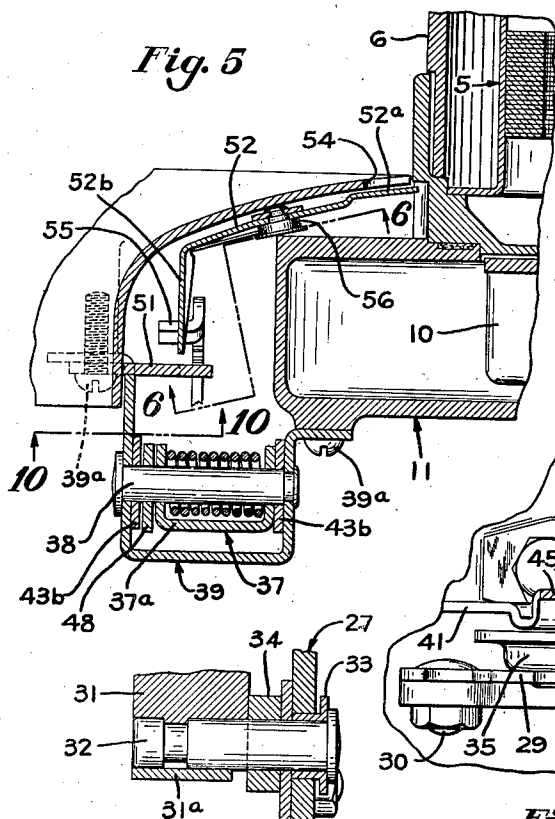


Fig. 6

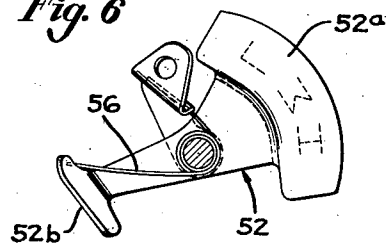


Fig. 7

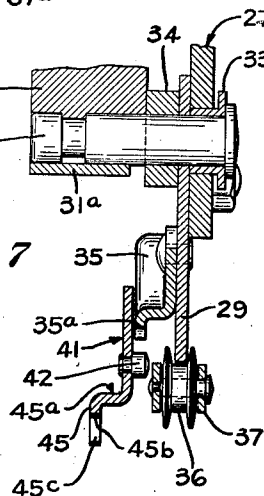


Fig. 8

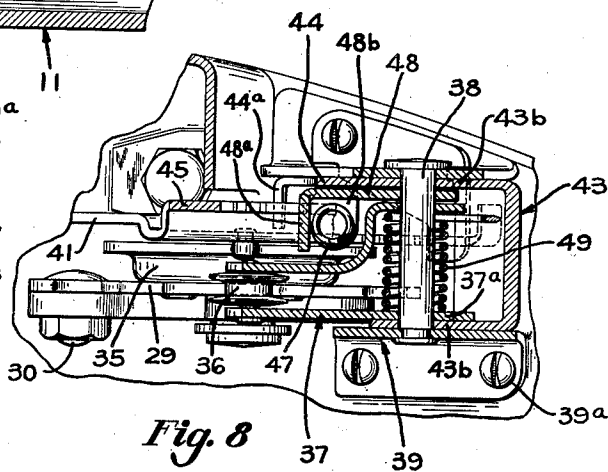


Fig. 9

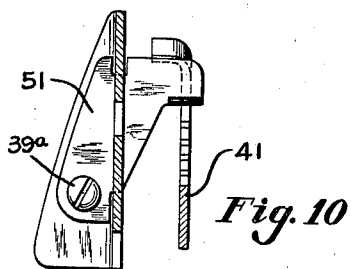
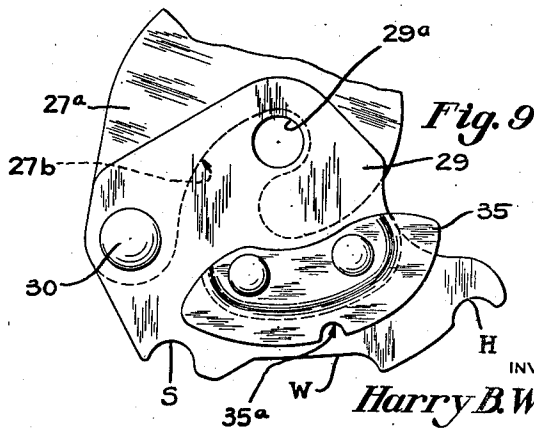


Fig. 10

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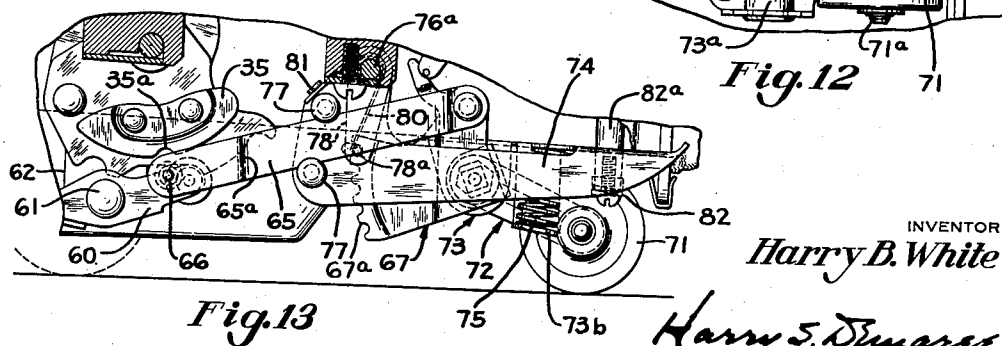
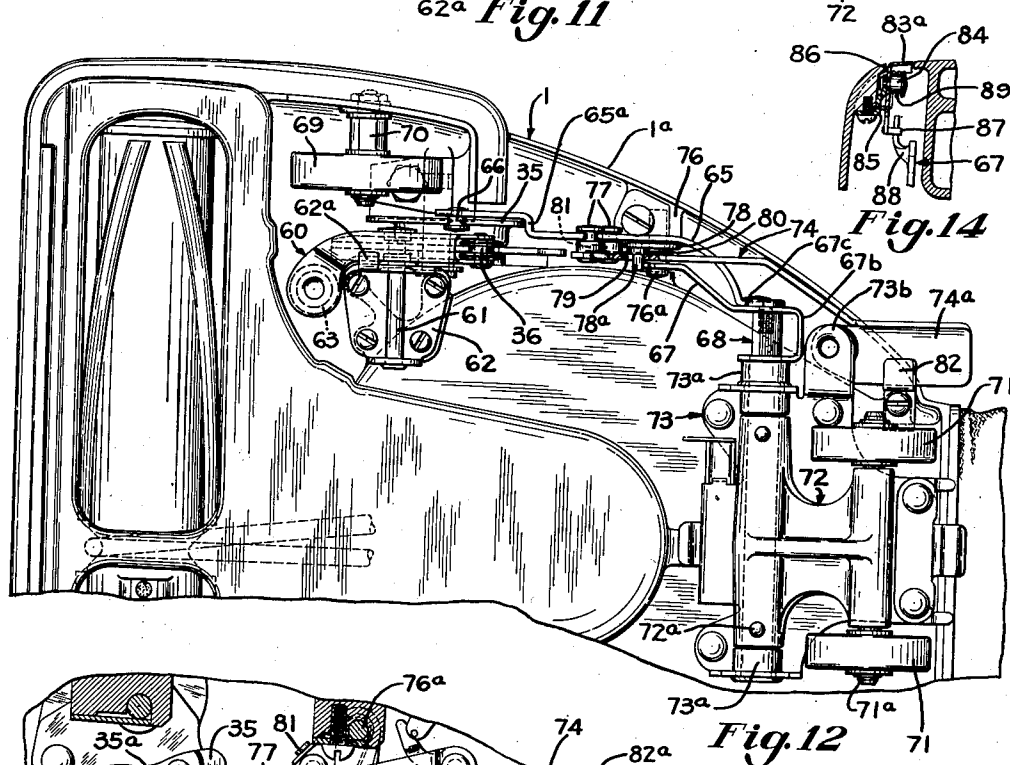
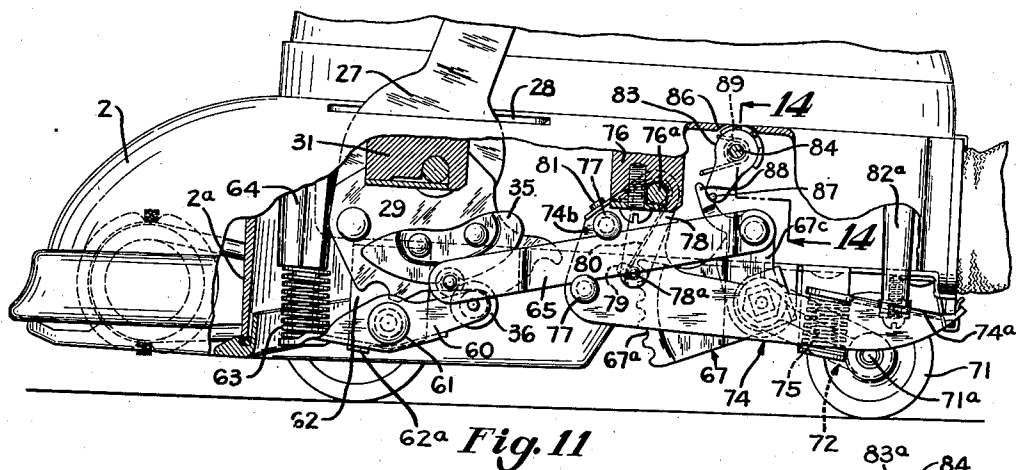
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SUCTION CLEANER

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4 Sheets-Sheet 4



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2,188,381

SUCTION CLEANER

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Application April 22, 1936, Serial No. 75,711

17 Claims. (Cl. 15—16)

This invention relates to improvements in suction cleaners and, more particularly to a foot controlled, handle operated mechanism for adjusting the height of the nozzle of a suction cleaner with respect to the surface of the floor covering being cleaned.

As is well understood in the art of suction cleaning, it is quite necessary to adjust the height of the nozzle of a suction cleaner with respect to the surface of the carpet or other floor covering over which the cleaner is to be operated, it having been determined from experience that the effective cleaning of different kinds and texture of carpet is promoted by varying or adjusting the nozzle height. It has long been the practice to equip suction cleaners, and particularly those of the portable, handle maneuvered type, with a nozzle adjusting device operating through a pivoted front or rear wheel supporting bracket by turning a knob, to raise or lower the nozzle portion of the cleaner.

The various types and kinds of nozzle height adjusting devices are quite satisfactory for the purpose intended, except in the matter of convenience of operation, since it is necessary for the operator to bend over or kneel down in order to make the adjustment.

The object of the present invention is to provide an improved means for adjusting the nozzle height by utilizing the handle as the operating member, so that by moving the handle through a predetermined arc, the nozzle of the cleaner may be raised or lowered without effort. Bearing in mind, however, that the handle of a suction cleaner is pivotally mounted on the cleaner casing and swings freely during normal cleaning operations, it is necessary to provide mechanism manually operative to connect temporarily the handle with the nozzle adjusting mechanism for the purpose of making the adjustment. This mechanism is preferably foot controlled to eliminate the necessity of leaning over or bending down during any part of the adjusting operation. Thus, the operator merely depresses a foot lever, at the same time manipulating the handle to make the desired nozzle height adjustment, whereupon the foot lever is released thereby disengaging the handle from the nozzle adjusting mechanism and otherwise restoring the cleaner for normal cleaning action.

A preferred embodiment of my invention is enclosed in the accompanying drawings, in which

Figure 1 is a general view in side elevation of a suction cleaner with portions broken away to

show the nozzle height adjusting mechanism applied to the front wheels.

Figure 2 is a bottom plan view of the cleaner, also with portions broken away to show the nozzle adjusting mechanism.

Figure 3 is an enlarged, detailed view of the nozzle height adjusting mechanism as taken on line 3—3 of Figure 2, and showing the position of the parts with the foot control lever in depressed position.

Figure 4 is a view identical with Figure 3 but with the parts restored to normal operating position after the foot lever has been released.

Figure 5 is a fragmentary detailed view in vertical section taken on line 5—5 of Figure 3.

Figure 6 is a perspective view of the nozzle height indicator as viewed from the under side thereof and from the direction indicated by line 6—6 of Figure 5.

Figure 7 is a detailed view in cross section through the adjusting mechanism as taken on line 7—7 of Figure 4.

Figure 8 is a detailed view in cross section through another portion of the adjusting mechanism as taken on line 8—8 of Figure 3.

Figure 9 is a view in elevation of the position control sector at the lower end of the handle bail with the auxiliary cam sector attached thereto.

Figure 10 is a detailed view of the fixed pawl member coacting with the safety ratchet sector on the connecting link as taken on line 10—10 of Figure 5.

Figure 11 is a view in side elevation and corresponding generally to Figure 1 but showing the application of a modified construction for the nozzle adjusting mechanism, wherein the adjustment functions through the rear wheels.

Figure 12 is a fragmentary bottom plan view of the cleaner and nozzle adjusting mechanism shown in Figure 11.

Figure 13 is a view in side elevation of a portion of the nozzle adjusting mechanism shown in Figure 11 with the parts in position for normal cleaning operation, and

Figure 14 is a detailed view in vertical section through the nozzle height indicator, as taken on line 14—14 of Figure 11.

Referring to Figures 1 and 2, the organization of what may be termed a standard type of suction cleaner will first be considered. The main casing of the cleaner includes a nozzle section 2 extending transversely of its forward end and from thence gradually converges toward its rear end, as clearly shown in Figure 2. The nozzle section

2 is a hollow chamber enclosed by the top, front and end wall portions of the casing including a depending vertical wall 2a at the rear thereof, said chamber being open at its bottom but normally closed by a bottom plate 3 having a wide slot extending lengthwise thereof to form the suction mouth. Within the nozzle section is a rotating agitator 4 extending lengthwise thereof immediately above the suction mouth, said agitator having longitudinally extending beater elements 4a and brush elements 4b suitably arranged on the surface thereof. The agitator is driven by the motor 5 (Figure 5) housed within the dome-like casing 6 surmounting the main casing 1, a belt 7 engaging a centrally located pulley groove on the agitator 4 and a small driving pulley 8 at the lower end of a vertical shaft 9 forming an extension of the armature shaft of the motor. This shaft 9 also carries the suction producing fan 10 enclosed within a fan chamber 11 generally circular in shape, its outline being clearly visible on the under side of the casing in Figure 2.

A circular opening or eye 12 formed in the bottom wall of the fan chamber concentric with the vertical axis of the fan, provides the inlet to said fan chamber from an air passage extending rearwardly from the nozzle chamber, said passage being formed by a cover plate 13 preferably formed integral with the bottom plate 3 over the nozzle mouth. The combined cover and bottom plate is removable as a unit, having detachable connection with the bottom of the main casing 1 by means of a manually operated latch 14 which, for the purpose of this disclosure, need not be described in detail. And finally, the fan chamber terminates in an exhaust outlet 15 opening at the rear end of the casing 1 and to which is attached a dust bag 16 into which the dust and dirt exhausted from the cleaner is collected.

The cleaner is supported on wheels at its forward and rear ends. A pair of front wheels 17-17 are located at the ends of and immediately to the rear of the nozzle section 2 just within the depending marginal wall 1a which forms a skirt-like enclosure for the open space surrounding the fan chamber. The front wheels are journaled on short horizontal stub shafts 18-18 carried at the ends of a wheel supporting crank shaft 19 having its end portions bent at right angles to form crank arms 19a-19a. As clearly shown in Figures 1 and 2 the main portion of the shaft 19 is journaled in bearings 20-20 located immediately behind the nozzle section 2 and adjacent the top edge of the vertical wall 2a, with the crank arms 19a-19a depending in a general downwardly direction but with a slight inclination towards the rear of the cleaner. Thus it will be seen that by oscillating or swinging the wheel supporting shaft 19 through a limited arc, the wheels 17-17 will be shifted vertically relative to the casing 1, thereby raising or lowering the nozzle with respect to the floor level, depending on whether the wheel supporting crank arms 19a-19a are swung forwardly or rearwardly.

It may be stated at this point that the nozzle adjusting mechanism embodying the present invention is operatively connected with the wheel supporting crank shaft 19 to shift the wheels in a forward or clockwise direction as viewed in Figure 1, their movement in the opposite or counterclockwise direction being governed by a compression spring 21 interposed between a radial arm 22 fixed to the crank shaft 19 and a

downwardly facing seat 23 on the casing 1 as clearly shown in Figures 1 and 2, this spring 21 acting to exert a force upon the wheel supporting crank shaft 19 to rotate the same in a counterclockwise direction.

In addition to the front wheels 17-17, the casing is also provided with a pair of wheels 24-24 supporting the rear end portion of the cleaner. These wheels are journaled at the ends of a short axle 25 supported in a bracket 26, fixed to the bottom of the fan chamber.

The foregoing description completes the main structural features of the cleaner, with the exception of the handle by which the cleaner is maneuvered over the floor surface. It is not considered necessary to disclose the entire handle, same being of the usual length and arrangement found in cleaners of the type herein disclosed, although the lower end portion of the handle is shown, the same having the form of a U-shaped bail 27 which straddles the dome-like motor hood 6 and has pivotal connection at its ends with the casing 1.

The end portions of the bail 27 are preferably enlarged as at 27a and these enlarged ends extend through slots 28 in the top wall of the casing 1 and have pivotal connection with the cleaner body therebelow, as will presently be disclosed. Associated with the bail is a handle position control device consisting primarily of a cam sector 29 carried by one of the enlarged ends of the bail, and a spring actuated roller 36 adapted to engage cam notches in the edge of the sector to hold the handle in certain predetermined positions.

Such a device is not an uncommon feature of suction cleaners, and hence there is nothing particularly novel in its application in the present disclosure, except that the handle control sector 29 is shown as a separate plate fastened to the enlarged bail end 27a by means of a bolt 30 passing through their overlapping forward edge portions, as clearly shown in Figure 9. Only one bolt 30, however, is used for attaching the control sector 29 to the enlarged bail end 27a, and in order that this connection shall not be a pivotal one the shank of the bolt is preferably rectangular in section and fitting complementary rectangular or square bolt holes in the two connected members as shown in Figure 3.

The upper edge of the plate 29 tapers to a blunt point and immediately therebelow is a circular bolthole 29a which registers with the upper end of a curvilinear relief slot 27b curving upwardly and rearwardly from the bottom edge of the enlarged bail end 27a (Figure 9).

Now, referring to Figures 2 and 7, a bearing boss 31 will be noted immediately below each slot 28. These bosses are cast integral with the casing 1 and support bearing pins 32 within downwardly facing cavities formed in their bottom faces and held in place by means of locking plates 31a. These bearing pins 32 have headed ends which project laterally and inwardly beyond the bosses, bushings 33 being mounted upon the extreme outer end of the bearing pins 32 to provide bearings for the bail end portions 27a. On the pin carrying the handle position control sector plate 29, however, a spacing block 34 is added between the plate and the bearing boss as in Figure 7. And finally, on the inner face on the control sector plate 29 is an auxiliary sector 35, positioned immediately below the bolt hole 29a, its lower edge forming a substantially symmetrical, curvilinear cam, offset laterally from the

surface of control sector plate 29 and provided intermediate its ends with a semi-circular shaped notch 35a.

But to complete the handle position control mechanism, the cam roller 36 which bears against and contacts with the lower edge of the control sector 29, is a grooved disc journaled between the bifurcated end portions of a spring-pressed supporting lever 37. This lever, extending horizontally and rearwardly from the sector 29 and terminating at a short distance there-beyond, is widened into a U-shaped bearing portion 37a which is journaled on a fixed transverse bearing pin 38 supported at opposite ends in a U-shaped bearing bracket 39 having its end portions bent upwardly and at right angles and by means of screws 39a is bolted to the under side of the cleaner casing as clearly shown in Figures 5 and 8. And finally, extending rearwardly from the bottom or transverse web of the central bearing portion 37a of the lever arm 37 is another arm 37b supporting one end of a coil spring 40, its upper end bearing on a post 40a depending from the under side of the casing 1 (Figures 3 and 4). This spring acts to force the cam roller 36 at the opposite end of the lever 37 against the handle position control sector 29, although the movement of the lever under the tension of the spring is limited by contact of the arm 37b with an up-turned flange 39b on the rear edge of the supporting bracket 39. Thus, the cam roller 36 contacting the handle control sector 29 may engage either one of two semi-circular notches s and h at opposite ends of the sector, thereby acting to retain the handle in one of its extreme positions, namely, storage position and horizontal or lowered position, or in the intermediate elongated notch w which corresponds to the working range or arc through which the handle normally swings in the operation of the cleaner.

Considering now the more essential feature of the invention, namely, the foot control handle operated nozzle height adjusting mechanism, the same as shown in Figure 2, is located on the underside of the casing 1 just rearwardly of one of the front wheels 17 and within the space or cavity between the marginal wall 1a and the fan chamber 11. More exactly, the adjusting mechanism is associated with the handle position control mechanism and hence functions on the same side of the casing. In describing the nozzle height adjusting mechanism, it is proposed to take up first, the operating or actuating member directly responsible for the raising and lowering of the front wheels, then, take up the means connecting this operating member with the handle and, finally, the foot actuated controlling means associated therewith.

A somewhat large irregularly shaped link 41, extending in a direction transverse to the axis of the front wheels 17, is pivotally connected near its forward end and along its lower edge to the stub shaft 18 on which the adjacent wheel 17 is journaled and, as clearly shown in Figure 2, lies in a vertical plane between the wheel and the adjacent crank arm 19a. Now, the connection between the link and the crank arm 19a is such that, assuming an endwise movement in a horizontal direction is imparted to the link, the wheel supporting crank shaft will be oscillated through a relatively small arc, its movement in a forward direction, at least, being limited by the bluntly pointed forward end 41a of the link 41 abutting the vertical wall 2a just forwardly of the front wheels. Incidentally, the endwise shifting move-

ment of the link 41 in the opposite or rearward direction is also limited, but by pawl and ratchet devices which hold the wheels in one of several adjusted positions except when the link is released by a foot actuated control lever, as will later be set forth.

Referring to Figure 7, it will be seen that the link 41 is parallel with but offset from the handle control sector 29 and more particularly lies immediately adjacent the lower edge portion of the cam sector 35 on the handle control sector 29. Now, carried by the link 41 is a pin 42 projecting laterally toward the cam sector 35 from a point substantially midway the ends of the link. In Figure 4 it will be observed that the pin 42 is disposed well below and out of contact with the sector 35 and as a consequence the bail 27 is free to swing with the handle. But let it be assumed for the moment, that the rear end of the link 41 is raised slightly, so that the pin 42 is brought into contact with the bottom edge of the cam sector 35. Now, if the handle is swung into a substantially vertical position, the pin 42 will then engage the notch 35a in the edge of the sector 35, and if sufficient pressure is applied to hold the pin in the notch a pivotal connection is established between the link 41 and the bail 27, so that by swinging the handle in one direction or the other the wheels are displaced bodily causing the forward or nozzle portion of the cleaner to be raised or lowered with respect to the floor.

Now, the nozzle adjusting mechanism also includes means for shifting the link 41 into operative connection with the handle to obtain the desired nozzle height adjustment and likewise to bring about the disengagement of the handle and link 41 after the adjustment has been made, namely, the foot actuated control lever 43.

This lever 43 is mounted adjacent its forward end on bearing pin 38 and extending rearwardly therefrom, follows the side wall 1a of the casing 1 just inside thereof and terminating at its rear end in a pedal extremity 43a projecting beyond the edge of the casing. The foot lever is preferably stamped of sheet metal and generally of inverted U shape in section to a point just short of the bearing pin 38, where it assumes the form of two upright transversely spaced ears 43b-43b having bearing on the pin 38 immediately inward from the side walls of the bracket 39, as clearly shown in Figures 5 and 8. Now, one of these ears 43b (on the right in Figure 5), has a forward extension or arm 44 terminating in a finger 44a bent inwardly at right angles toward the outer face of the link 41. Immediately below this finger is a ratchet sector 45 extending along the lower edge of the link 41 directly below the pin 42 and inclined to the horizontal at an angle of approximately thirty degrees from front to rear. This ratchet sector 45 is offset from the vertical plane of the link along an upwardly facing shoulder 45a which serves as an abutment for the finger 44a, the latter contacting the shoulder when the foot lever is released from its depressed position as in Figure 3, thereby positively depressing the link 41 and disengaging the pin 42 from the notch 35a as in Figure 4.

Extending downward at right angles to the arm 44 just forwardly of the bearing pin 38, is another arm 46 integral with arm 44, and having its end portion bent at right angles and inwardly in the same direction as the finger 44a to provide a supporting foot 46a for a coil spring 47. Now, pivotally mounted on the bearing pin 38 just inwardly from the arm 44 of the foot lever 43 is

a pawl lever 43 terminating at its forward end in a pawl member 48a bent inwardly at right angles thereto and having along its lower edge a foot 48b also bent inwardly at right angles to form a support for the upper end of the coil spring 47 as clearly shown in Figures 1 and 3. The upper edge of the pawl member 48a is bevelled and contacts the teeth 45b of the ratchet sector 45 of the link 41. These ratchet teeth have slightly rounded points or tips to permit the pawl 48a to pass from one to another with comparative ease during the adjusting movement and at the forward end of the sector 45 an abrupt shoulder or abutment 45c serves as a limit stop for the pawl member 48a. The pawl lever 43 is thus operatively connected with and actuated by the foot lever 43 through the spring 47. Thus, when the foot lever 43 is pressed downwardly from the position shown in Figure 4 to that in Figure 3, the lower spring supporting foot 48a on the arm 46 swings upwardly through a small arc in a clockwise direction thereby compressing the spring 47, which in turn urges the pawl 48a upwardly and against the ratchet sector 45. Conversely, on releasing the foot lever the tension of the spring 47 is relieved sufficiently to allow the pawl 48a to drop with the link 41 under the pressure exerted by the finger 44a against the shoulder 45a thereof, but still maintaining engagement with the ratchet teeth 45b.

Now, the foot pedal 43 is normally held in its normal or inoperative position as shown in Figure 4, by means of a torsion spring 49 which is coiled around the central portion of the bearing pin 38 with its ends terminating in straight arms 49a and 49b, extending rearwardly from the top and bottom of the spring. The upper spring arm 49a bears against the top section of the lever 43 and the lower arm 49b against the lever 37 carrying cam roller 36 of the handle position control device. However, it is the compression spring 40 and not the torsion spring 49 that controls the cam roller supporting lever 37, it being noted that a circular opening 40b is provided in the top wall of the foot lever 43 to permit the spring to pass through it and abut against the post 40a depending from the bottom wall of the casing 1.

Thus far, the several parts of the adjusting mechanism have been identified and their function set forth. Hence, it is only necessary to explain the procedure in making a change in the nozzle height adjustment: First, the operator presses down the foot pedal 43 with his foot, whereupon the link 41 is raised by contact of the pawl 48a with the ratchet teeth 45b, this movement, as previously explained, placing the pin 42 in position to engage the notch 35a in the sector 35 carried at the lower end of the handle bail 27. The desired adjustment is then made by swinging the handle 27 forwardly or rearwardly, as the case may be, the operator in the meantime holding the foot pedal in its depressed position. The adjustment made, the foot lever is then released, whereupon the finger 44a strikes the shoulder 45a of the link 41 forcing it downwardly and thereby disengaging the pin 42 from the notch 35a and completely releasing the handle, although the adjustment just completed is maintained by the spring pressed pawl 48a engaging the particular ratchet tooth 45b reached during the adjusting operation.

It is to be observed in this connection, however, that dependance on the single pawl and ratchet connection for holding the link 41 in any

of its several adjusted positions, is not safe inasmuch as a shock or a sudden jar might readily cause the pawl to slip with a consequent change in the adjustment. For this reason, an auxiliary or safety pawl and ratchet device is provided at the rear end of the link 41, in the form of a ratchet sector 50 consisting of a series of ratchet teeth 50a along its bottom edge which correspond in number and disposition to the ratchet teeth of the primary ratchet sector 45. Now, coacting with the ratchet teeth 50a is a fixed pawl 51 located just below the sector 50 and having the form of a horizontally arranged blade with a beveled forward edge. Figures 5 and 10 show the exact formation and mounting of this fixed pawl, the same being a laterally extending portion of a somewhat irregularly shaped plate fastened to the under side of the outermost marginal flange of the U-shaped bracket 39 by means of one of the screws 39a which fasten the bracket to the under side of the casing 1. Thus the pawl forming portion of the plate 51 projects horizontally and inwardly beneath the rear end portion of the link 41 and in position to be engaged by the teeth 50a of the ratchet sector 50. Referring now to the function of the safety ratchet, it will be noticed that in the depressed position of the foot lever 43, the link 41 has been elevated to bring the pin 42 into position to engage the notch 35a in the cam sector 35. (See Figure 3.) In this position the teeth of the safety ratchet 50 are entirely disengaged from the fixed pawl 51. However, upon releasing the foot lever 43 after the adjustment has been made, the parts resume the positions shown in Figure 4 wherein the ratchet sector 50 engages the fixed pawl 51 at the tooth corresponding to the particular nozzle height adjustment existing at the time. Thus, when the handle is not connected with the link 41 through the pin and notch, the safety ratchet is operative to hold the link in place, but is inoperative during the adjusting operation.

Now, as a desirable, although not altogether an essential part of the nozzle height adjusting mechanism is the nozzle height indicating device shown in Figures 3, 4, 5 and 6. Briefly the indicating device comprises a lever 52 having at one end an arcuate panel 52a on which the letters "H", "M" and "L" are arranged in order. These letters stand for "high", "medium" and "low", respectively. The indicator lever 52 is pivotally mounted intermediate its ends on a bracket 53 suitably secured to the under side of the top wall of the casing 1 with the arcuate panel portion 52 thereof registering with an opening 54 in the top wall of the casing 1. The other end portion of the indicator member 52 is bent downwardly at right angles in a generally vertical direction and in close proximity to the rear end of the link 41. The depending end of the indicator 52 is shaped to form a triangular shaped cam having an oblique edge which bears against a contact finger 55 formed by bending the tip end of the link 41 at right angles. As clearly shown in Figures 5 and 6, a spring 56 acts on the lever 52 to normally hold it in contact with the link 41, so that as the same is shifted forwardly and rearwardly in a general horizontal direction during any handle actuated nozzle height adjustment, the indicator operates accordingly to bring the corresponding height adjustment designation into register with the opening or window 54 in the top of the casing. There is perhaps only one point to be brought out

in connection with the otherwise simple and obvious construction and operation of the nozzle height indicator, namely, that its movement responds only to the horizontal movement of the link 41 and not to its oscillating vertical movement, this being due to the fact that the oblique edge of the depending portion 52b of the indicator lever is arranged tangentially to the arc described by the free end of the link 41 and as a consequence, no movement is transmitted to the indicator, except by the endwise shifting of the link.

The foregoing completes the description of one embodiment of the so-called foot controlled handle-actuated nozzle height adjusting mechanism, characterized chiefly by the fact that the adjustment is accomplished by the raising and lowering of the front wheels. While this is a perfectly satisfactory arrangement it is equally practical to obtain the same adjustment by raising and lowering the rear wheels. A nozzle height adjusting mechanism of the latter type is disclosed in Figures 11 to 14 inclusive.

Essentially the cleaner structure is the same for both types of nozzle adjustment, therefore only those parts which differ in form and function will be described in detail, the remainder being merely re-identified where necessary. Thus, the handle 21 with its position control sector 29, the auxiliary sector 35 with its notch 35a centrally of its curvilinear bottom edge, are duplicated in the rear wheel actuated type of nozzle adjustment. Similarly, the spring pressed cam roller 36 coacts with the handle control sector 29 as before, but the cam lever supporting the same is reversed, that is to say, the roller is journaled at its rear end instead of its front end. Thus, as shown in Figure 11 this lever 60 with the roller 36 journaled at its rear end is itself journaled intermediate its ends on a transverse bearing pin 61 supported in a bracket 62 suitably attached to the underside of the cleaner casing. The lever 60 is tensioned at its forward end by a coil spring 63 interposed between a suitable seat at the end of the lever and an anchor post 64 depending from the top wall of the casing at a point just above the spring. A lug 62a on the lower edge of the bracket 62 acts to limit the downward movement of the spring pressed end of the cam lever 60.

As before, the handle position control device has no relationship with the nozzle height adjusting mechanism, other than serving as a convenient support for the cam sector 35. A link 65 corresponding generally to the link 41 in the previous construction, extends rearwardly with a slight upward inclination from a point just below the sector 35 and carries at its forward end a laterally projecting pin 66 adapted to engage and disengage the notch 35a in the bottom edge of said sector. This link is of uniform width and flat for the most part, except for an abrupt offset inwardly and toward the cam sector 35 and marked by a shoulder 65a located opposite the rear end of said sector and acting as a limit stop for the endwise shifting movement of the link as will later be pointed out. The rear end portion of the link 65 is curved inwardly from the side wall of the casing and in general conformity to the rearwardly tapering contour thereof, as is readily apparent from Figure 12. The rear end of the link 65 has pivotal connection with a ratchet lever 67 disposed in vertical plane and extending in a general horizontal direction from front to rear of the cleaner and having a relatively wide arcu-

ate toothed sector 67a along its forward edge from whence it extends at an oblique angle laterally and inwardly, terminating at its rear end in a U-shaped bearing portion 67b which is fitted on to the square end of a shaft 68 which supports the adjustable rear wheel support as will presently be pointed out. The link 65 is connected with the ratchet lever 67 through a rocker arm 67c extending upwardly from the U-shaped end portion 67b substantially in vertical alignment with the square end of the shaft 68.

Leaving for the moment the adjusting mechanism and directing attention to the arrangement of the wheels, it will be noted that while their location on the casing remains unchanged their mounting is reversed, that is, the front wheels are journaled on fixed axles and the rear wheels on an adjustable or hinged bracket, as will clearly be seen by comparing Figures 2 and 12. Thus, the front wheels 69—69 are journaled on fixed stub shafts 70—70, whereas the rear wheels 71—71 with their axle 71a are mounted at the free end of a pivoted arm 72 carried by the shaft 68. A bracket 73 fixed to the underside of the casing supports a pair of bearing bushings 73a—73a in which the shaft 68 is journaled, said shaft being fixed to the arm 72 by pins 72a. As shown in Figures 11 and 13 the arm 72 supporting the rear wheels 71—71 and their axle, normally assumes an inclined position such that the wheels are disposed rearwardly of the supporting bracket 73 and somewhat below the rear end of the cleaner casing. Thus by rocking the shaft 68, whereby the rear wheels are raised and lowered bodily with respect to the casing, the entire cleaner casing will be tilted in a forwardly and rearwardly direction with the front wheels as the fulcrum in much the same manner as the rocking of the front wheel supporting shaft raised and lowered the nozzle in the previous arrangement. In fact, much the same movement is embodied in both the front wheel and rear wheel type of nozzle height adjusting mechanisms.

There still remains to be considered, however, the foot controlled mechanism which functions to establish an operative connection between the link 65 and the handle through the cam sector 35, as well as to maintain that connection after the adjustment has been made. The foot actuated control is similar in principle to that of the previously described nozzle height adjustment mechanism, although utilizing a somewhat different combination of elements.

As before, the mechanism includes a foot lever 74 extending adjacent to and parallel with the link 65 as clearly shown in Figure 12. The rear end portion of the foot lever is offset inwardly to conform to the contour of the cleaner casing, thus bringing its pedal extremity 74a adjacent the exhaust outlet. Just forwardly of the pedal extremity 74a of the foot lever 74 and bearing against the under surface thereof is a coiled spring 75 supported at its lower ends on a supporting foot 73b integral with the bracket 73 of the rear wheel assembly. At the forward end of the foot lever 74 is an upwardly extending arm portion 74b giving the lever a somewhat L-shape and having pivotal connection at its upper end with a bearing pin 76a carried by a depending bearing support 76 formed integral with the bottom wall of the cleaner casing 1. Along the forward edge of the vertically extended arm portion 74b of the lever 74 are two pins 77—77 spaced vertically apart a distance substantially equal to the width of the link 65 and having projecting

headed portions embracing the link between them but permitting the endwise sliding movement of the same.

Also pivotally supported on the bearing pin 76a is a spring pressed pawl lever 78 located between the link 65 and the foot lever 74, said pawl lever depending from its pivot and carrying at its lower end a pawl pin 78a which projects laterally therefrom and thence through a slot 79 formed in the foot lever 74 at a point substantially centrally of the enlarged end portion 74b thereof, said slot being extended in a general horizontal direction and having a length substantially twice the diameter of the pin 78a with its rear end in close proximity to the toothed edge 67a of the ratchet lever 67. And finally a spring 80 is coiled around the bearing pin 76a with one end inserted beneath a retaining lug 81 along the upper edge of the foot lever adjacent the bearing pin 76a while the opposite end extends downwardly and bears against the pawl pin 78a so that the action of the spring is at all times to force the pawl pin 78a toward the toothed sector 67a of the ratchet lever 67.

Referring now to the purpose and function of the foot controlled portion of the adjusting mechanism, attention is first directed to the Figure 13 in which the parts of the adjusting mechanism occupy their normal positions wherein the foot lever 74 assumes a substantially horizontal position under the tension of the spring 75 and the forward end of the link 65 is depressed so that there is no engagement between the pin 66 and the notch 35a of the cam sector 35. Moreover, the pawl pin 78a engages the topmost notch in the toothed sector 67a of the ratchet lever 67, being firmly held in place by the spring 80. Now, assuming that a different nozzle height adjustment is desired, the operator presses downwardly on the foot lever 74 (which movement is limited by the foot 82 at the lower end of the depending post 82a), whereupon several operations are successively performed. In the first place, the link 65 being supported between the pins 77—77 on the foot lever 74 is moved upwardly until the pin 66 comes in contact with the lower cam edge of the sector 35, and ultimately into engagement with the notch 35a, when the handle is moved into vertical position. Accompanying the upward tilting of the link 65, which movement establishes the operating connection between the handle and the link 65, there takes place a disengagement of the pawl pin 78a with the toothed sector 67a of the ratchet lever 67. This disengagement is the result of the pin being carried forwardly in the slot 79 as the foot lever is depressed. However, it is to be noted that the pawl pin 78a is not released from the ratchet sector 67a until the engagement has taken place between the link pin 66 and the notch 35a in the cam sector 35 carried by the handle, but as soon as the connection is completed then the ratchet lever 67 is immediately released by the pawl pin 78a so that the link 65 can now be shifted forwardly or rearwardly by the swinging movement of the handle. This movement as has already been explained, is transmitted to the pivotally mounted rear wheel arm 72 through the ratchet lever 67 and the shaft 68.

Now, as soon as the nozzle has been adjusted to the proper height above the floor level the foot lever 74 is released and under the tension of the spring 75 is immediately returned to its normal inoperative position as shown in Figure 13. However, at the commencement of the upward swing-

ing movement of the foot lever 74, the pawl pin 78a on the pawl lever 78 is immediately carried toward the toothed sector 67a and into engagement with the particular tooth corresponding to the particular height adjustment that has just been made, this pawl and ratchet engagement being completed before the pin 66 at the forward end of the link 65 is released from the notch 35a in the cam sector 35. In other words, the adjustment is locked in place before the handle is released from the adjusting mechanism.

In connection with the action between the pawl pin 78a and the ratchet lever 67, the topmost tooth of the sector 67a is somewhat longer than the others and thus acts as a stop to control the distance or amount that the link can be shifted endwise in a forwardly direction, and consequently the distance or amount that the rear wheels can be retracted to raise the front nozzle portion above the floor. A similar stop is provided for limiting the endwise movement of the link 65 in a rearward direction, this being the shoulder 65a formed just rearwardly of the forward end of the link 65, and which strikes the foremost pin 77 on the foot lever 74, thereby limiting its endwise movement in a rearward direction.

A height indicating device is incorporated in the rear wheel actuated type of nozzle height adjustment, the same being sufficiently similar to that already described as to permit of a brief reference thereto. In this case, the indicator 83 is mounted on a horizontal stub shaft 84 carried by a supporting bracket 85 secured to the outer wall of the cleaner casing 1 immediately adjacent an upwardly facing window or opening 86 therein (Figure 14). In this instance a semi-cylindric flange 83a around the upper edge of the indicator, carries the height designations "H"—"M" and "L", these being visible through the window 86 as the indicator is rotated through an arc of something less than 180 degrees. At the lower end of the indicator lever 83 is a laterally projecting pin 87 which has contact with an actuating finger 88 integral with the ratchet lever 67 and extending forwardly and upwardly from a point immediately in front of the point of pivotal connection of the link 65 with the upright arm 67c of said lever 67. A spring 89 is arranged to maintain contact between the indicator lever 83 and the actuating finger 88 at all times, said finger obviously moving through an arc as the ratchet lever 67 swings with the caster bracket.

As already stated, the two types of nozzle adjusting mechanism are essentially the same in function and principle of operation both embodying the idea of raising and lowering the nozzle of a cleaner by moving the handle forwardly and rearwardly through a given arc, the range of adjustment being preferably adjacent or near the upright or vertical position of the handle such as it would normally assume when the cleaner is inoperative and hence a particularly advantageous position for making the nozzle height adjustment. And coupled with the handle operating feature is the foot control lever, which not only functions to make the handle temporarily available for adjusting purposes but operates the necessary ratchet devices for holding the adjustment and preventing the accidental dislodgment thereof during cleaner operation.

Having thus disclosed two applications of the improved nozzle height adjusting mechanism to a suction cleaner; I claim as my invention:

1. In a suction cleaner, the combination of a casing having a nozzle portion, a handle pivot-

ally mounted on said casing, a wheel carrying member mounted on said casing to swing in a direction to raise and lower said nozzle portion, a link carried by said wheel carrying member and normally adapted to contact an abutment on said casing to hold the wheel-carrying member in a fixed position, and a lever adapted to be operated to shift said link out of contact with said abutment and into operative engagement with said handle, whereby the latter is temporarily connected with said wheel-carrying member to effect the raising and lowering of said nozzle portion by said handle while said lever is held in its operating position.

2. In a suction cleaner, the combination of a casing having a nozzle portion, a handle pivotally mounted on said casing, a wheel-carrying member pivotally mounted on said casing for swinging movement in a direction to raise and lower said nozzle portion, a link carried by said wheel-carrying member and normally adapted to engage an abutment on said casing to hold said wheel-carrying member in a fixed position, and an operator-actuated lever adapted to be depressed to contact and shift said link out of engagement with said abutment and into temporary engagement with said handle to effect the raising or lowering of said nozzle portion thereby while said lever is in its depressed position.

3. In a suction cleaner, the combination of a casing, a handle and a vertically adjustable wheel supporting member, both pivotally mounted on said casing, a link connected with said wheel supporting member, said handle having a portion adapted to engage said link, means normally engaging said link for holding said wheel supporting member in a given position of adjustment, and operator-actuated means for shifting said link out of engagement with said holding means and into and out of engagement with said handle.

4. In a suction cleaner, the combination of a casing, a handle pivotally mounted on said casing, a vertically adjustable wheel supporting member pivotally mounted on the underside of said casing, a link connected with said wheel supporting member and having a portion lying adjacent the pivot point of said handle, means for normally holding said link against movement, said handle having a portion adapted to engage said link and disposed radially from said pivot point, and operator-actuated means for shifting said link out of engagement with said holding means and into operative connection with the portion of said handle adapted to engage said link.

5. In a suction cleaner, the combination of a casing, a handle and a wheel supporting member both pivotally mounted on said casing, a link operatively connected with said wheel support, a member normally engaging said link to hold said wheel supporting member in a given position of adjustment, said handle and link having interconnecting members normally disposed in disconnected relation, and a foot operated lever adapted to shift said link out of engagement with said holding means and then successively into and out of operative connection with said handle.

6. In a suction cleaner, the combination of a casing, a handle pivotally mounted on said casing for normal free swinging movement during cleaning operation, a wheel supporting member pivotally mounted on the casing, means for normally holding said wheel supporting member in

a given position of adjustment, a link operatively connected with said wheel support and adapted in its endwise shifting movement to impart a predetermined oscillating motion to said pivoted wheel supporting member, said handle having a radially disposed link engaging portion, and a foot lever operative in its movement in one direction to shift said link into position to be engaged by said link-engaging portion of the handle.

7. In a suction cleaner, the combination of a casing having a nozzle portion, a handle pivotally mounted on said casing, supporting wheels including a support therefor pivotally mounted on said casing and adapted to be swung through a predetermined arc to thereby raise or lower the nozzle portion of the casing, means for normally holding said wheel in a given position of vertical adjustment, a link connected with said wheel supporting member, said handle having a portion extended radially from its pivot point and disposed adjacent said link and adapted to have operative connection therewith and a foot operated lever adapted to shift said link into and out of operative connection with said handle and further to disengage said wheel holding means to free the wheels for vertical adjustment while the said link and handle are in operative connection.

8. In a suction cleaner, the combination of a casing having a nozzle portion, a handle pivotally mounted on said casing, supporting wheels including a support therefor pivotally mounted on said casing and adapted to be swung through a predetermined arc to thereby raise or lower the nozzle portion of the casing, means normally holding said supporting wheels in a given position of vertical adjustment, a link connected with said wheel supporting member and provided with a projection, said handle having a portion extended radially from its pivot point adjacent said link and having a notch adapted to be engaged by said projection and a foot operated lever adapted in its normal position to maintain said link out of operative connection with said handle and in its depressed position to shift said link into operative connection with said handle.

9. In a suction cleaner, the combination of a casing having a nozzle at one end, a handle pivotally mounted on said casing, wheels mounted at the forward and at the rear ends of said casing, one of said wheels being journaled at the end of a crank arm pivotally mounted on the under side of said casing and adapted to be swung through a predetermined arc to raise and lower the nozzle end of said casing, a link connected with said crank member and extending adjacent the pivot point of said handle, the latter having a radially disposed sector provided with a notch in the edge thereof adapted to be engaged by a pin carried by said link, the latter being normally disengaged from said notch to permit the free swinging of said handle during the normal operation of said cleaner, a fixed member mounted on said casing and adapted to be engaged by said link to normally hold the same in a given position of said crank member, a spring actuated foot lever, a pawl operatively connected with said foot lever and adapted to contact a toothed sector on said link to shift the latter out of engagement with said holding means and into pin and notch connection with said handle in the depression of said lever, and means coacting with said pawl to hold said link in its adjusted position.

10. In a suction cleaner, the combination of a

casing having a suction nozzle, a handle pivotally mounted on said casing and normally adapted to swing freely in the operation of the cleaner, wheels mounted at the forward and at the rear ends of said casing, one of said wheels being journaled at the end of a crank arm pivotally mounted on the under side of said casing and adapted to be swung through a predetermined arc to raise and lower the suction nozzle of said casing, a link connected at one end with said crank member and extending adjacent the pivot of said handle, the latter having a radially disposed arcuate sector provided with a notch in the edge thereof adapted to be engaged by a pin carried by said link, pawl and ratchet means for normally holding said link in a given position of adjustment, a spring actuated foot lever, a pawl member operatively connected with said foot lever and contacting a ratchet sector on said link whereby in the depression of said lever said link is shifted out of engagement with said ratchet holding means and into operative connection with said handle through said pin and notch and thence is shifted endwise in the swinging movement of said handle to effect a predetermined adjustment of said wheel support, whereupon said pawl lever functions to hold said link in adjusted position upon the release of said foot lever.

11. In a suction cleaner, the combination of a casing, a handle pivotally mounted on said casing and normally adapted to swing freely in the operation of the cleaner, a wheel carrying member pivotally mounted on said casing and shiftable to raise and lower one end of said casing, means for normally holding said wheel carrying member in a given position of vertical adjustment, a link carried by said wheel carrying member, said link and handle having co-acting interconnecting members normally retained out of contact with each other and a spring actuated foot lever having link contacting members, one operative to shift said link into operative connection with said handle during its depression and the other operative to swing the link out of operative connection with said handle upon the release of said foot lever and means associated with said link and foot lever for holding said link in its adjusted position subsequent to its release from operative connection with said handle.

12. In a suction cleaner, the combination of a casing, a handle pivotally mounted on said casing and normally adapted to swing freely in the operation of the cleaner, a wheel carrying member pivotally mounted on said casing and shiftable to raise and lower one end of said casing, a link carried by said wheel carrying member, means for normally holding said link in a given position of adjustment, said link and handle having co-acting interconnecting members normally retained out of contact with each other and a spring pressed foot operated lever having link contacting members, one operative to shift said link into operative connection with said handle during its depression and the other operative to swing the link out of operative connection with said handle upon the release of said foot lever and pawl and ratchet members acting automatically to hold said link in its adjusted position subsequent to its release from operative connection with its handle.

13. In a suction cleaner, the combination of a casing, a handle pivotally mounted on said casing and normally free to swing in the opera-

tion of the cleaner, supporting wheels at the opposite ends of said casing, one of said wheels being carried by a pivoted support, a link connected at one end with said pivoted wheel support and having a laterally projecting pin adjacent its opposite end, said handle having a cam sector with a notch therein adapted to be engaged by said pin in the shifting of said link bodily toward said sector, and means for shifting said link into and out of operative connection with said handle, comprising a foot lever having a member adapted to contact one edge of said link to shift the same into pin and notch connection with the handle when said lever is shifted in one direction and another link contacting member adapted to disengage said link from said handle during the movement of said foot lever in the opposite direction and means for holding said link in adjusted position subsequent to its disengagement with said handle.

14. In a suction cleaner, the combination of a casing, a handle pivotally mounted on said casing and normally free to swing in the operation of the cleaner, supporting wheels at the opposite ends of said casing, one of said wheels being carried by a pivoted support, a link connected at one end with said pivoted wheel support and having a laterally projecting pin adjacent its opposite end, said handle having a cam sector provided with a notch therein adapted to be engaged by said pin in the shifting of said link bodily toward the cam sector, and means for shifting said link into and out of operative connection with that handle comprising a spring actuated foot lever mounted on said casing, a spring actuated pawl operative by the depression of said foot lever to engage a toothed sector of said link and hold the latter in operative connection with said handle during the nozzle height adjusting operation, a link engaging member carried by said foot lever and adapted to disconnect said link from said cam sector during the retraction of said foot lever subsequent to the endwise adjustment of said link by the swinging of said handle, said pawl acting through said ratchet teeth to retain said link in its endwise adjusted position.

15. In a suction cleaner, the combination of a casing, a handle pivotally mounted on said casing to swing a wheel at one end of the casing, a pivoted support for said wheel including a crank arm, a link connected with said crank arm, a cam sector on said handle adjacent its pivot point and positioned in close proximity to said link, said sector and link having interconnecting members adapted to be disengaged in the normal position of said link, a foot operated lever having operative connection with said link to shift the same into and out of operative connection with said handle, a spring pressed pawl lever operatively connected with said foot lever and adapted to contact a toothed sector on said link and shift the same into operative connection with said handle in the movement of said foot lever in one direction, whereby said link may be shifted endwise by said handle to adjust the height of the cleaner nozzle through said wheel support, a fixed pawl on said casing and an auxiliary, toothed sector on said link coacting with said fixed pawl to hold said link in adjusted position when disengaged from said handle.

16. In a suction cleaner, the combination of a casing, a handle pivotally mounted on said casing, supporting wheels for said casing, a wheel carrying member movable to effect the vertical

adjustment of said wheels relative to said casing, means for normally holding said wheel carrying member in a given position of adjustment, and a member shiftable in one direction to dis-
5 engage said wheel carrying member temporarily from said holding means and into operative engagement with said handle to effect the vertical adjustment of said wheels by swinging said handle into a predetermined position, said last mentioned member being releasable to effect the re-
10 engagement of said wheel carrying member with said holding means upon completion of the adjusting operation.

casing having a nozzle, a handle pivotally mounted on said casing, supporting wheels mounted adjacent said nozzle, a wheel carrying member pivotally mounted on said casing for vertically
5 adjusting said wheels to raise and lower said nozzle, a link connected with said wheel carrying member and normally adapted to hold the same in a given position of wheel adjustment, and operator-actuated means for temporarily
10 shifting said link into operative connection with said handle to effect the vertical adjustment of said wheels by the swinging movement thereof.

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17. In a suction cleaner, the combination of a