

[54] **VACUUM CLEANER WITH NOZZLE HEIGHT ADJUSTING MECHANISM**

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[51] Int. Cl.<sup>2</sup> ..... A47L 5/34

[58] Field of Search ..... 15/354, 355, 356, 361, 15/339

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[57]

**ABSTRACT**

An upright vacuum cleaner having a suction nozzle at the front of the bottom of the chassis is provided with a nozzle height adjustment mechanism for varying the elevation of the rear wheel relative to the chassis to provide at least four nozzle height positions. The rear axle is journaled on the chassis and includes a pair of offset legs on which a respective rear wheel is mounted. An adjustment lever is journaled on the offset leg on one side of the cleaner and extends upwardly through the chassis passing through a slotted locking plate. The lever includes a plurality of teeth spaced along the longitudinal axis of the arm on the forward facing side thereof and a plurality of teeth on the opposite side offset slightly from the first set of teeth. A spring is secured to the lever and to the chassis to bias the lever to lock a selected one of the teeth with the plate. The top of the lever is bent to form a pedal engaged by the foot of an operator. A spring wire rod is secured at one end to the adjustment lever and extends upwardly through an indexed slot within which it is entrapped to indicate the nozzle height position.

**7 Claims, 5 Drawing Figures**

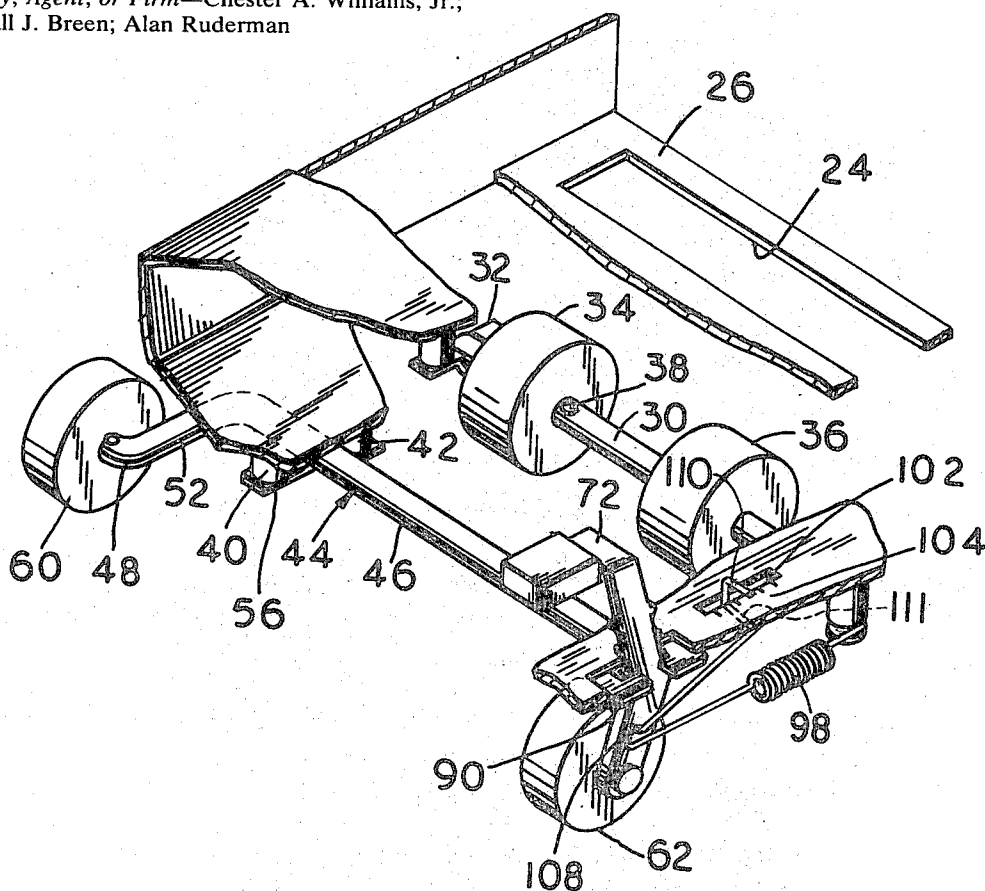


FIG. 1

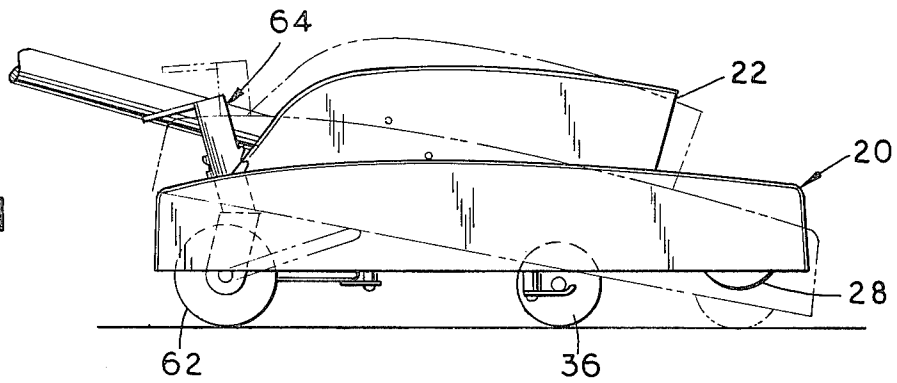


FIG. 2

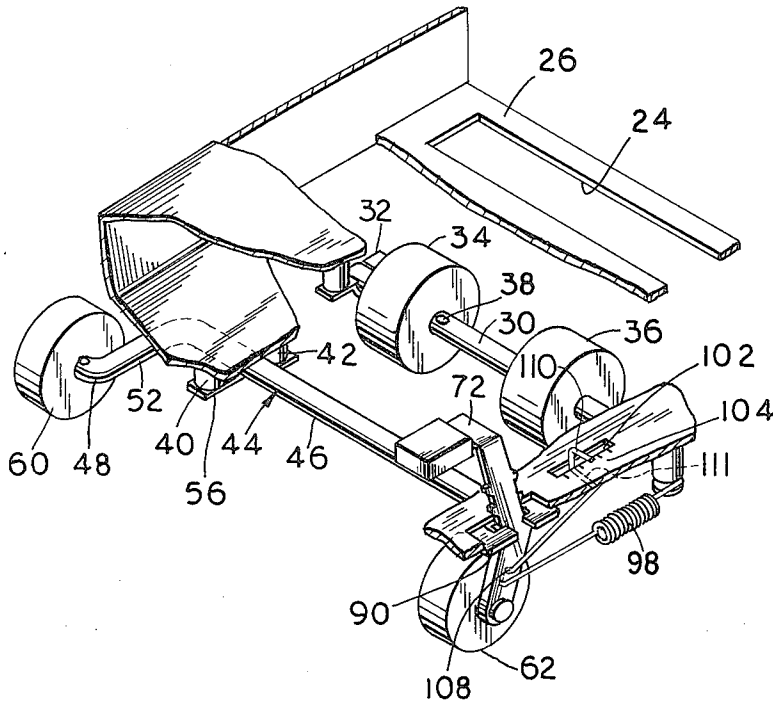


FIG. 4

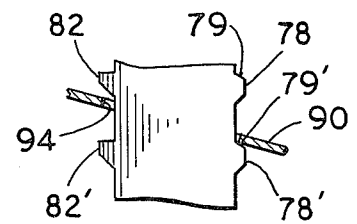
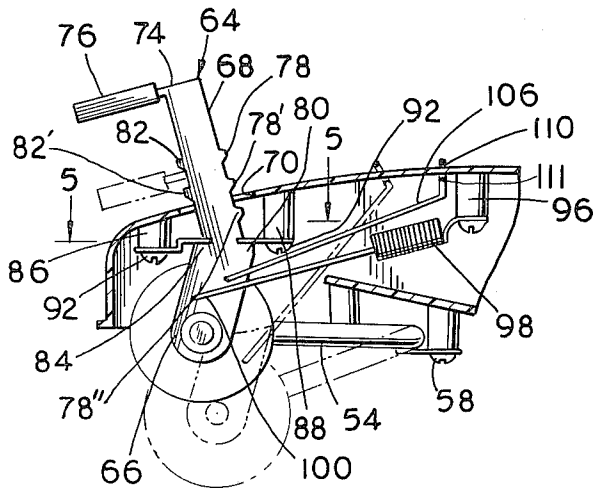


FIG. 3

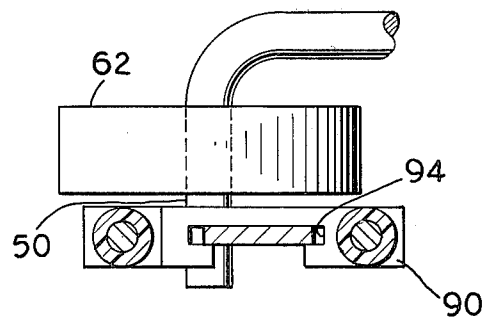


FIG. 5

# VACUUM CLEANER WITH NOZZLE HEIGHT ADJUSTING MECHANISM

## BACKGROUND OF THE INVENTION

This invention relates to vacuum cleaners and more particularly to a vacuum cleaner of the floor cleaning type having means for selectively raising and lowering the suction inlet nozzle depending on the type of floor covering being cleaned.

Vacuum cleaners of the floor cleaning or upright type generally include a chassis having a nozzle at the bottom thereof through which air is sucked by an air moving motor-blower unit, a rotary brush mounted adjacent the nozzle for contacting the floor surface to agitate and loosen the dirt so that it may be sucked free of the surface, and wheels mounted at the front and rear of the chassis for supporting the cleaner for rolling on the floor. These vacuum cleaners are called upon to clean many different kinds of modern floor coverings varying in pile thickness from the short outdoor or patio type to the long deep shag type. In order to clean these various floor surfaces effectively it is known to vary the nozzle height to locate the nozzle at a level above the surface to provide the proper suction and flow path for the particular type of floor covering or surface being cleaned and to position the brush at the proper height.

While nozzle height adjusting mechanisms have been used for many years, the earlier mechanisms were generally limited between two nozzle positions in which the nozzle was adjusted between a carpet cleaning level and a bare floor cleaning level. With the onslaught of the many different kinds of modern floor covering the nozzle had to be adjusted between a plurality of elevations and required more complex mechanisms. This complexity and the inherent multiplicity of parts have made it more expensive to manufacture and assemble an upright vacuum cleaner.

## SUMMARY OF THE INVENTION

Therefore, the primary object of the present invention is to provide a nozzle height adjusting mechanism for an upright vacuum cleaner which may be adjusted for a plurality of nozzle heights and which comprises a relatively few parts which are inexpensive to manufacture and assemble.

Another object of the invention is to provide an upright vacuum cleaner having a nozzle height adjusting mechanism which is economical to manufacture and simple to use.

A further object of the invention is to provide an improved nozzle height adjusting mechanism for a vacuum cleaner of the upright type including a simple and inexpensive nozzle position indicator.

A still further object of the invention is to provide an improved nozzle height adjusting mechanism in a vacuum cleaner of the upright type in which a spring biased adjustment lever cooperates with a locking plate to adjust the rear wheels relative to the chassis.

Accordingly, this invention provides a nozzle height adjusting mechanism for a suction cleaner having a suction intake nozzle for floor cleaning, and front and rear wheels for supporting the cleaner for movement on the floor. The rear wheels are mounted on offset ends of a rear axle formed with a central portion journaled in the rear of the chassis. A foot operated adjustment lever is journaled on one of the offset ends of the rear axle. A

plurality of teeth are formed on the front edge of the lever which cooperates with a locking plate to lock the lever and hence the rear wheels in any selected elevation by means of a spring biasing the lever against the front of the locking plate. The lever also includes a plurality of teeth spaced along the rear edge thereof which aids in effecting a step-by-step indexing of the front teeth relative to the locking plate. A nozzle height position indicator is also included within the scope of the present invention which comprises a spring wire rod journaled at one end on the adjustment lever and entrapped in a slot in the chassis at the other end. The entrapped portion slides along the slot as the lever is moved to indicate the nozzle height in cooperation with indicies along the edge of the slot.

## BRIEF DESCRIPTION OF THE DRAWINGS

The particular features and advantages of the invention as well as other objects will become apparent from the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is an elevational view of a vacuum cleaner embodying the present invention with the solid lines illustrating a high nozzle height position and the dotted lines illustrating the lowest nozzle height position;

FIG. 2 is a perspective view in diagrammatic form of a portion of the cleaner of FIG. 1 illustrating the details of construction of the nozzle height adjusting mechanism of the present invention;

FIG. 3 is a partial elevational view of the rear portion of the cleaner illustrated in FIG. 1 illustrating the movement of the rear wheels between its highest and lowest nozzle position;

FIG. 4 is an enlarged view of a portion of the adjustment lever showing the relation of the front and rear teeth to the locking plate; and

FIG. 5 is an enlarged cross section taken substantially along line 5-5 of FIG. 3.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the accompanying drawings, wherein like reference numerals denote similar parts throughout the various views, there is disclosed a substantial portion of a vacuum cleaner of the type known as a floor cleaner, or upright suction cleaner. A cleaner of this type is shown in its entirety in U.S. Pat. No. 3,163,439 which issued on Dec. 29, 1964 to the same assignee as the present invention, and since the propelling handle, dust bag and motor-blower unit are conventional and form no part of the present invention and are not necessary for a clear understanding thereof, reference may be had to said patent for a full disclosure of a complete cleaner.

The vacuum cleaner includes a chassis 20 on the top of which is secured a hood 22. Mounted in the bottom of the chassis is an electric motor and a pair of fan impellers which communicates through a discharge duct between the chassis, an access plate 26 and the hood with a dust bag assembly. Reference may be had in the aforesaid U.S. Pat. No. 3,163,439 for a full disclosure of the motor, fans and bag assembly. A vacuum cleaner inlet nozzle 24 is formed in the access plate 26 at the forward portion of the bottom of the chassis and communicates the dirt laden there with the fans. A rotary floor brush assembly 28 is mounted in the nozzle above the opening 24 so as to contact the floor surface when

the cleaner nozzle is at its proper elevation for the floor to be cleaned. Conventionally, a belt (not shown) drives the brush assembly from a spindle on the motor-fan shaft.

Mounted in a recess formed at the bottom of the chassis is a front wheel axis 30 which is maintained in the recess by means, for example, of a front axle retaining plate 32 at each end of the axle. A pair of wheels 34 and 36 may be rotatably mounted on the axle 30 and axially retained thereon by any conventional retaining means such as the upset 38. A pair of downwardly depending bosses 40 and 42 having a bearing recess formed therebetween are cast on opposite sides on the rear of the chassis. A rear axle 44, including a central portion 46 having offset arm portions 48 and 50 depending from crank arms 52 and 54, is journaled on the central portion in the bearing recesses and pivotably maintained therein by retaining plates 56 secured to the bosses by screws 58. Rotatably mounted on the free extremity of each offset end 48 and 50 is a respective rear wheel 60 and 62. As in the aforesaid United States Patent, turning of the rear axle about the central portion 46 results in a raising or lowering of the rear wheel 60 and 62 relative to the chassis. In other words, a lowering or raising of the chassis and the nozzle relative to the rear wheels results when the rear axle 44 is turned in its bearing seats.

Journaled on the offset rear axle 50 is an adjustment lever 64. One end portion 66 of the lever is journaled on the arm 50 and extends upwardly to a second portion which includes an arm 68 at an obtuse angle to the arm 66 and extends upwardly through a slot 70 formed in the cleaner chassis. The free end of the arm 68 is bent inwardly as at 72 and rearwardly at 74. A foot pedal 76 may be mounted on the portion 74 for engagement by an operator for purposes which will hereinafter be understood. Formed on the forward facing edge of the arm 68 is a plurality of teeth 78, 78', 78'' etc. Preferably, at least three teeth plus a stop portion 80 are formed on the leading edge. The rear or trailing edge of the arm 68 is also formed with a plurality of teeth 82, 82' etc. and a stop portion 84. The number of rear teeth 82 is one less than the number of forward teeth 78, as will hereinafter be understood.

Mounted on a pair of based bosses 86 and 88 rearwardly of the central portion of the rear axle is a locking plate 90 secured to the bosses by means of screws 92. The locking plate includes a slot 94 extending in the direction of the front to the rear of the cleaner so as to have front and rear edges for engagement with the adjustment lever 64. The arm portion 68 of the adjustment lever is narrower than the slot 94 and is positioned within and freely passes therethrough. Secured to a boss 96 is one end of a coil spring 98 the other end of which is secured at 100 to the arm 66 of the lever 64 so as to bias the lever forwardly against the forward edge of the slot 94.

As illustrated in FIG. 4, the front teeth 78, 78' etc. are offset relative to the rear teeth 82 etc. in a plane substantially parallel to the locking plate 90. The upper surface portions 79, 79' etc. of the front teeth 78, 78' etc. trap under the front edge of the slot 94 in the plate 90 as a result of the pull of the spring 98. In order to reduce wear the draft angle with which the upper edges 79, 79' etc. are formed may be such that those surface 79, 79' etc. are substantially parallel to the plane of the plate 90. The bottom surfaces of both the front and

rear teeth are camming surfaces for purposes which will hereinafter become clear.

In operation when the cleaner nozzle is positioned in its lowest position, the top 79 of tooth 78 is below the slot 94 and locked into engagement with the bottom of the plate 90. This is the position for cleaning indoor-outdoor carpeting or bare floors, and if it is desired to raise the nozzle to clean higher pile carpeting, the operator applies a downward pressure to the pedal 76. This moves the lever 64 rearwardly and disengages the tooth 78 from the locking plate and causes the rear edge of the lever above the rear tooth 82 to engage with the rear edge of the slot 94. Due to the weight of the cleaner, gravity effects a turning of the rear axle 44 clockwise as viewed in FIGS. 1-3 and a dropping of the rear of the chassis relative to the rear wheels. The chassis thus pivots about the front wheels 34 and 36 until the top of the rear tooth 82 is momentarily locked under the rear edge of the slot 94. Removal of the pressure from the foot pedal 76 results in the spring 98 pulling the lever forwardly to engage the front of the slot at a point substantially on the bottom cam edge of tooth 78. The rear of the chassis then drops due to gravity until the upper surface 79' of tooth 78' is locked beneath the front of the slot 94. Similarly, the rear of the cleaner may be dropped sequentially to lower and lower positions thereby raising the height of the nozzle relative to the floor until its highest position is reached when the stops 80 and 84 are locked under the slot 94. Thus, skipping is eliminated and a step-by-step indexing of the nozzle is obtainable while going from the lowest nozzle position to the highest nozzle position.

To adjust the cleaner from its highest nozzle position to its lower position, the cleaner may be tipped forward to raise the rear wheels slightly off the floor and the pedal 74 is depressed. This causes the lever to move downwardly and pivots the rear axle 44 counterclockwise as viewed in FIGS. 1-3 thus raising the rear of the chassis about the front wheels 34 and 36. As the lever is depressed the bottom surfaces of the front and rear teeth alternately engage the respective edges of slot 94. Since these bottom surfaces are cam surfaces the lever is kicked rearwardly as the front cam surface rides against the front edge and is kicked forwardly as the rear cam surface rides against the rear edge of the slot. By controlling the downward movement on the foot pedal a step-by-step indexing may again be effected.

In order to indicate the nozzle height position an elongated slot 102 is formed in an upper portion of the chassis and includes a plurality of indicies 104 marked off on the chassis along the longitudinal edge of the slot. A wire indicator rod 106 is mounted at one end 108 in the arm 66 of the lever 64. The rod which is comprised of a spring metal wire is bent around its other end to form a substantially C-shaped end comprising an upper leg 110 and a lower leg 111. The indicator rod is mounted in the slot 102 with the leg 110 above the surface of the chassis and 111 therebelow. Thus, the free end of the rod is entrapped in slot 102 with the arm 110 performing as a pointer. The indicies 104 are calibrated to correspond to nozzle height positions provided by the teeth 78, 78', 78'' etc. As the lever is raised or lowered along with the rear wheel 62 the pointer 110 registers with the indicies to indicate to the operator the position of the nozzle above the floor.

It should thus be clear that a simple and inexpensive nozzle height adjusting mechanism comprising a minimum number of parts has been disclosed in this application. Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However it is to be understood that the present disclosure relates to a preferred embodiment of the invention which is for purposes of illustration only and not to be construed as a limitation of the invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.

Having thus set forth the nature of the invention, what is claimed herein is:

1. A nozzle height adjusting mechanism for a suction cleaner having a chassis including a suction nozzle inlet at the bottom thereof and first and second sets of wheels supporting said chassis for movement on a floor surface, said mechanism comprising: first axle means including a central portion journaled on said chassis and having offset arms formed on opposite ends of said central portion for journaling said first set of wheels, second axle means longitudinally spaced from said first axle for journaling said second set of wheels on said chassis, an adjustment lever having one end mounted on an offset arm of said first axle means and having a manually engageable free end extending through said chassis at a location longitudinally spaced from said central portion, said adjustment lever having a plurality of spaced teeth, a locking plate mounted on the chassis, and spring means biasing said lever in the longitudinal direction toward said central portion on said plate to lock a selected tooth against the plate.

2. A nozzle height adjusting mechanism as recited in claim 1 wherein said first axle means comprises an axle rearwardly of said second axle means and extending

from side to side of said chassis, said adjustment lever extending through said chassis at a location spaced rearwardly of said central portion.

3. A nozzle height adjusting mechanism as recited in claim 2 wherein said locking plate comprises a plate including a slot having front and rear edges secured to said chassis, said adjustment lever being narrower than said slot and extending therethrough, said teeth being spaced along the front of said lever to trap under the front edge of the slot.

4. A nozzle height adjusting mechanism as recited in claim 3 including teeth spaced along the rear of said lever for providing a positive stop when the lever is moved rearwardly thereby effecting a step-by-step indexing of the front teeth relative to the locking plate.

5. A nozzle height adjusting mechanism as recited in claim 4 wherein said locking plate is secured to the underside of said chassis and said slot is in a plane fixed relative to the chassis, said rear teeth are offset relative to said front teeth in a plane parallel to the plane of the slot.

6. A nozzle height adjusting mechanism as recited in claim 1 including a nozzle height position indicator, said indicator comprising an elongated aperture formed in the chassis, means defining indicia along said aperture, a rod mounted at one end on the adjustment lever, the other end of said rod being entrapped within said aperture and slidable relative thereto.

7. A nozzle height adjustment mechanism as recited in claim 6 wherein said other end of said rod comprises a substantially C-shape bend, one leg thereof being disposed above the chassis, the other leg being disposed below the chassis, and pointer means formed on said above the chassis.

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