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Nordeen et al.

[11] **3,848,292**

[45] **Nov. 19, 1974**

[54] **ADJUSTABLE WHEEL MOUNTING MEANS**

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[73] Assignee: **Whirlpool Corporation**, Benton Harbor, Mich.

[22] Filed: **Mar. 30, 1972**

[21] Appl. No.: **239,430**

[52] **U.S. Cl.** **15/339**, 15/354

[51] **Int. Cl.** **A47l 5/34**

[58] **Field of Search** 15/333, 354, 355, 356, 15/358, 359, 339

[56] **References Cited**

UNITED STATES PATENTS

2,107,016	2/1938	Snyder	15/354 X
2,841,812	7/1958	Lachowicz	15/355
3,262,147	7/1966	Waters et al.	15/354
3,683,448	8/1972	Lagerstrom et al.	15/354

Primary Examiner—Harvey C. Hornsby
Assistant Examiner—C. K. Moore
Attorney, Agent, or Firm—Hofgren, Wegner, Allen, Stellman & McCord

[57] **ABSTRACT**

A vacuum cleaner structure wherein a nozzle is mounted on a wheeled carriage, the front portion of the carriage being vertically adjustably positioned relative to the subjacent surface on which the wheels are disposed. Thus, the vacuum cleaner structure is adjustable for use with different height pile carpeting, i.e., from relatively low pile carpeting to deep shag carpeting. The wheel adjusting means includes a control member adjustably carried on the nozzle and means for adjusting the relationship of the front wheels of the carriage to the carriage as a function of adjustment of the control member. The adjustment control may include means for locking the control in different preselected positions of adjustment.

14 Claims, 9 Drawing Figures

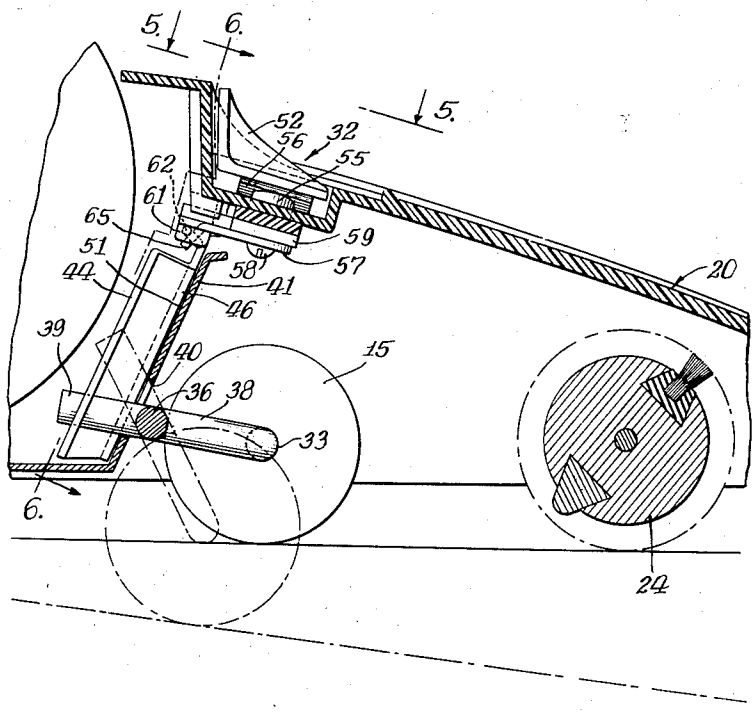


Fig. 1.

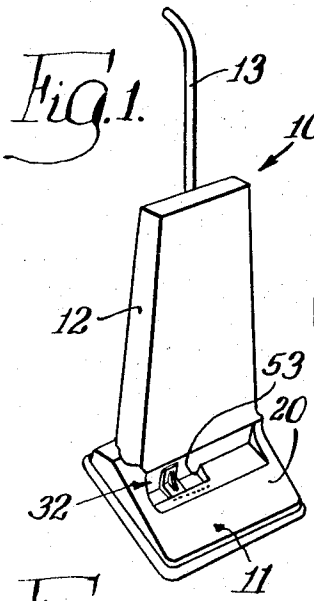


Fig. 5.

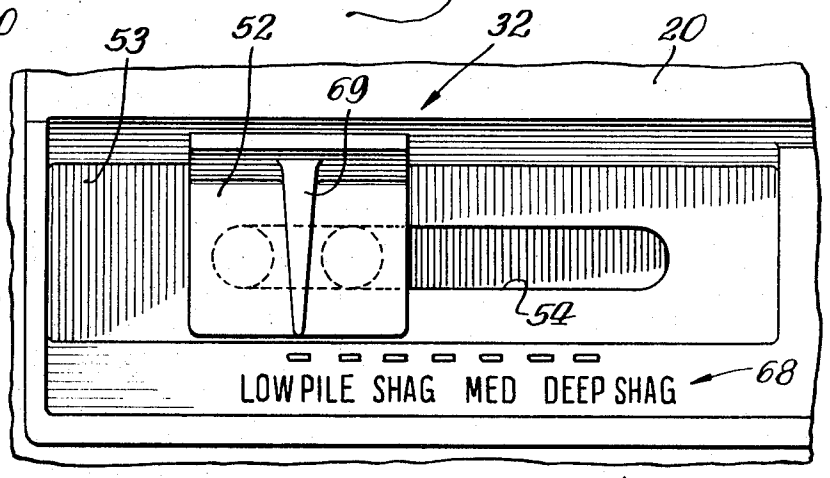


Fig. 2.

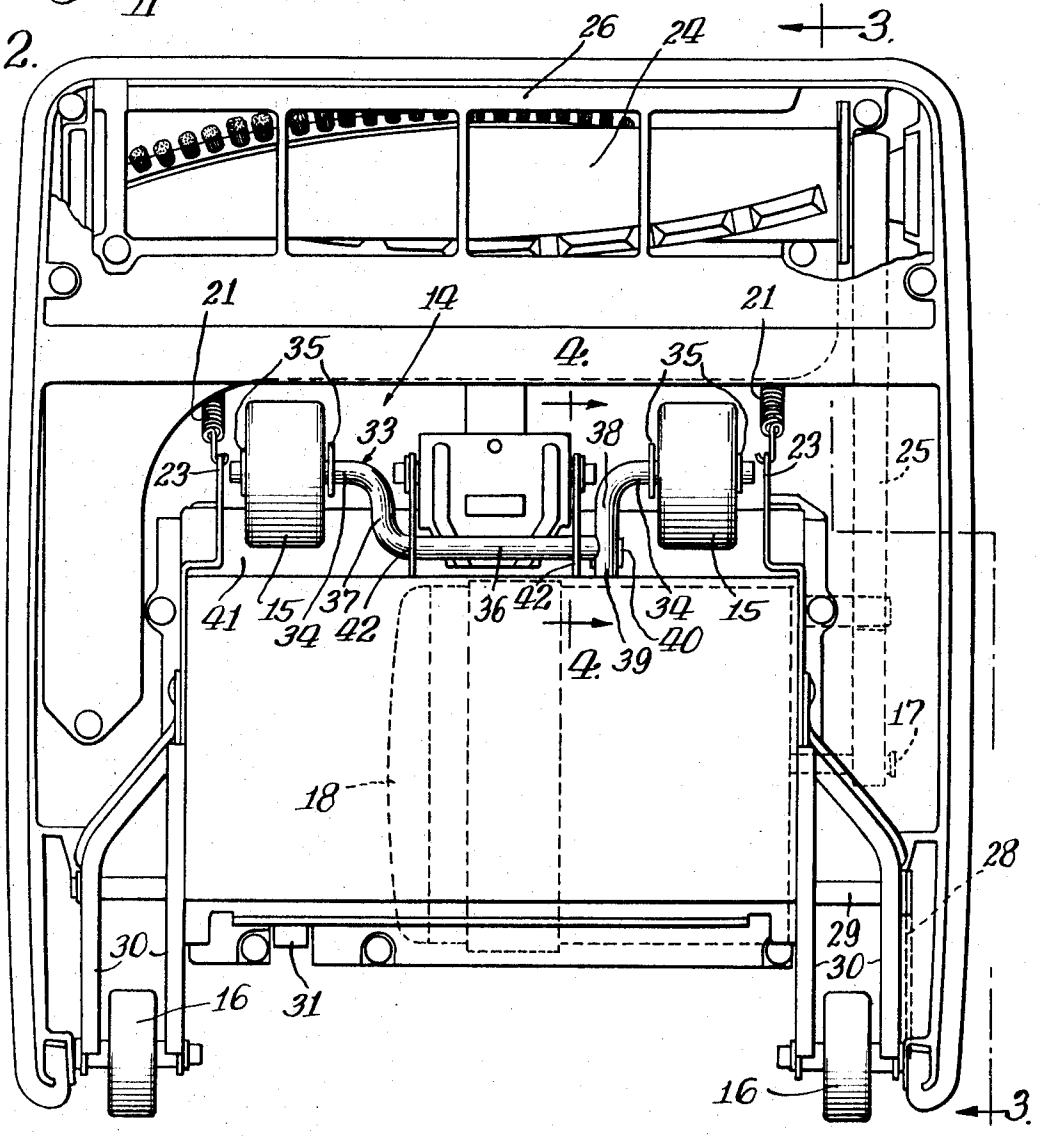


Fig. 3.

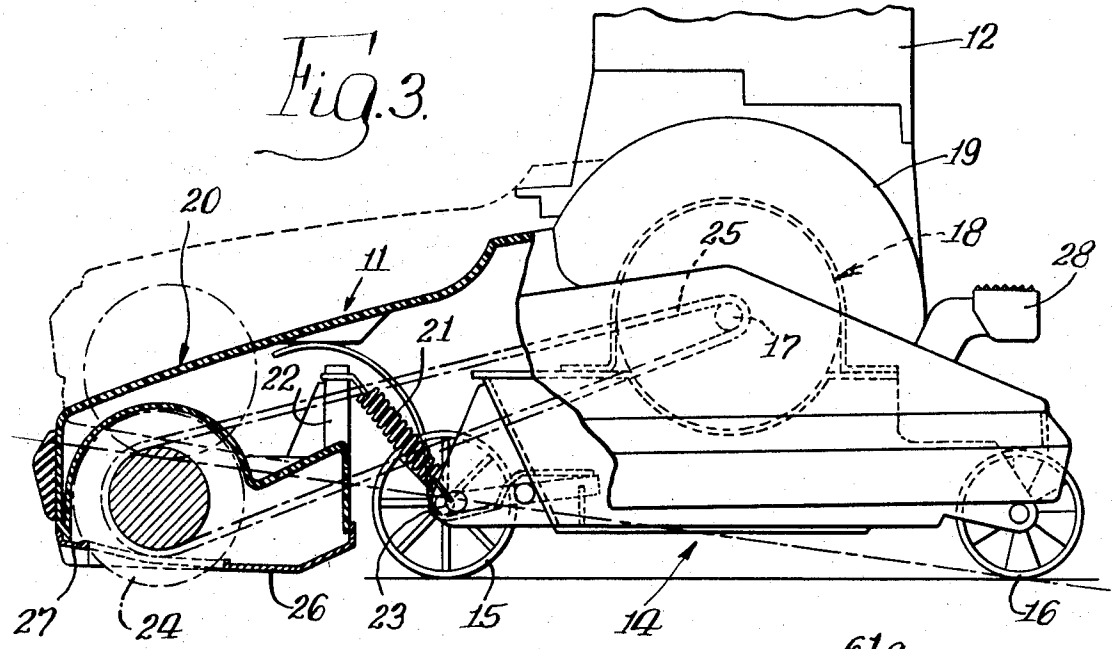


Fig. 4.

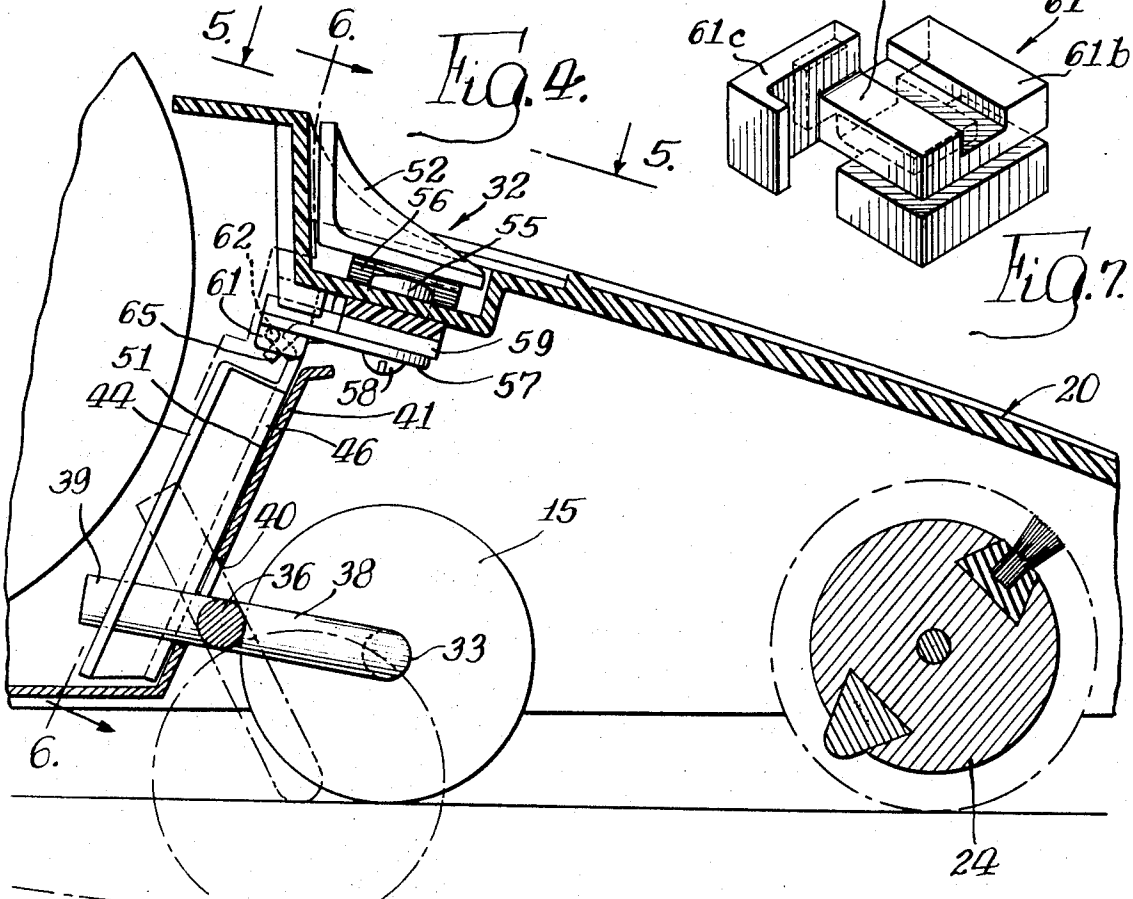


Fig. 7.

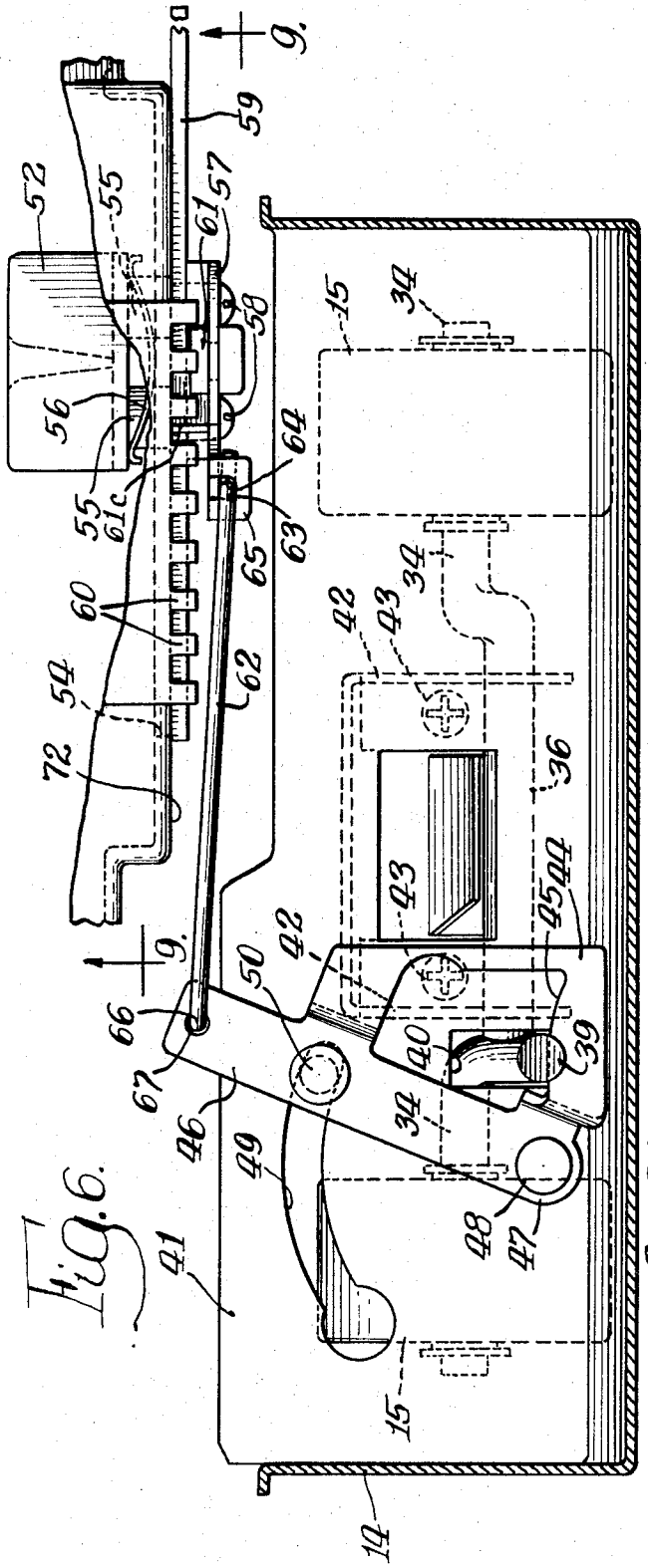


Fig. 6.

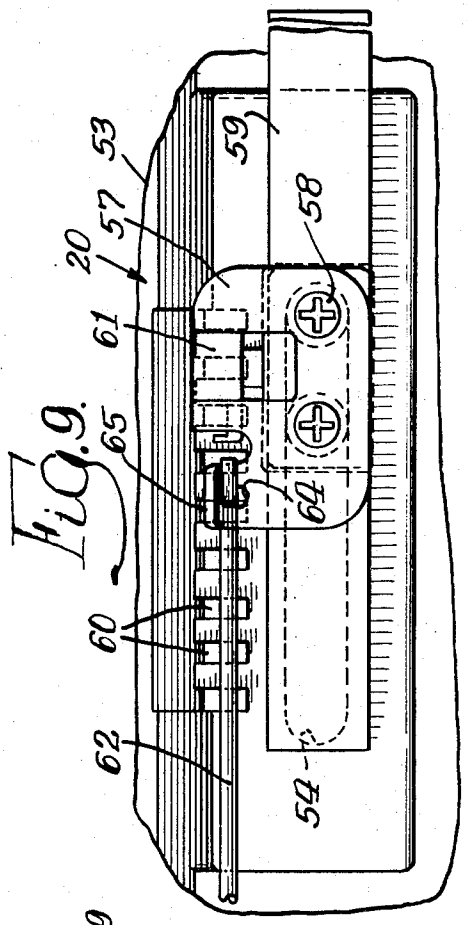


Fig. 9.

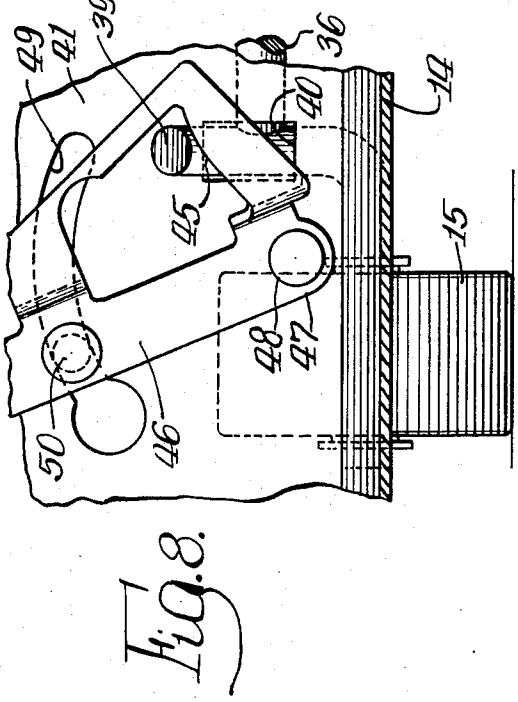


Fig. 8.

ADJUSTABLE WHEEL MOUNTING MEANS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to vacuum cleaners and in particular to means for adjusting the disposition of the vacuum cleaner carriage relative to the floor surface.

2. Description of the Prior Art

The broad concept of providing an adjustable nozzle vacuum cleaner is shown in U.S. Letters Pat. to R. S. Waters, et al., No. 3,262,147. Therein an offset adjusting lever is inserted through an aperture in the bottom wall of the cleaner housing. The lever is adapted to rotate about a vertical axis and includes a horizontal arm interposed between a cam surface and the central crank portion of an offset wheel axle carrying the front wheels of the cleaner. As the lever is rotated, the lever arm rides on the cam surface causing the lever and lever arm to move vertically either up or down depending on the direction of rotation of the lever. As the lever arm moves downwardly, it imparts movement to the central crank portion and thence to the front wheels.

A spring-biased member is positioned between the crank portion of the axle and the cover plate of the nozzle to maintain the axle it its adjusted position. The spring-biased member further may be effected to move the axle upwardly upon actuation of the lever arm in the opposite direction.

U.S. Pat. No. 2,730,751 to G. A. Brace shows a wheel adjustment for suction cleaners having a control lever which is pivoted on a rivet to cause one end thereof to shift crosswise of a leg of the axle and thereby cause the axle to be rotated a slight amount to raise the nozzle to the desired raised position.

U.S. Pat. No. 2,333,494 to E. L. Snyder shows a suction cleaner provided with a transversely slidable bar carried by brackets on the underside of the cleaner and having at its outer end a manually operable knob. The bar carries three spaced detent seats cooperating with a spring pressed ball detent.

Q. Berg U.S. Pat. No. 2,330,655 shows a suction cleaner having a manually operable wedge and a converter means for adjusting the disposition of the rear wheels of the suction cleaner.

In E. L. Snyder U.S. Pat. No. 2,107,016 a suction cleaner is shown having an offset wheel crank arm provided with a vertical shaft extending upwardly to a manually adjustable threaded knob. The manual rotation of the knob results in the raising or lowering of the vertical shaft and thus causes the wheels to be raised or lowered correspondingly.

G. A. Brace U.S. Pat. No. 2,734,216 shows a suction cleaner having a wheel adjustment and handle lock arranged to raise the agitator out of contact with the carpet when the handle is disposed at an inclined "rest" position.

G. A. Brace U.S. Pat. No. 2,763,887 shows an adjustable nozzle suction cleaner similarly disclosing means for raising the nozzle to an off-the-floor position and is constructed to so arrange the vacuum cleaner whenever the handle is in either of two normally nonpropelling positions.

In J. R. Eades U.S. Pat. No. 3,439,375 a vacuum cleaner with nozzle height adjusting mechanism is shown to include a cam lever having a flat portion formed with two threaded holes, a cam stud is threaded into one of the holes to extend upwardly from the upper surface of the flat portion to engage the lever arm or central portion of the rear wheel axle. The rear portion of the vacuum cleaner is biased to a lower position corresponding to a nozzle raised position by the weight of the cleaner as after the cam stud is lowered.

The U.S. Letters Pat. No. 3,579,699 to J. L. Balzer shows a suction cleaner nozzle adjustment including an elongated control member having spaced lower and upper elongated slots, and a hand grip. The wheel shaft extends through the lower slot to support the adjusting control member rotatably with the upper portion of the adjusting control member projecting upwardly through a slot in the nozzle. Cam surface means are provided for cooperation with a pin detent means for effecting desired adjustment of the nozzle.

SUMMARY OF THE INVENTION

The present invention comprehends an improved vacuum cleaner structure for adjusting a carriage relative to the subjacent floor surface, which is extremely simple and economical of construction while yet providing improved positive control of the adjustment. Thus, the control structure is adapted for use in a vacuum cleaner having a carriage, front wheels, rear wheels rotatably carried by the carriage, and a nozzle on the carriage. The control structure includes axle means for journalling said front wheels for rotation about a horizontal wheel axis, means mounting the axle means to the carriage for pivotal movement about a pivot axis parallel to and spaced from the wheel axis, a control member adjustably carried by the nozzle, locking means for releasably retaining the control member in any one of a plurality of different preselected adjusted positions, and a connector connected between the control member and a portion of the axle mounting means spaced from the pivot axis defining means for effectively positively pivoting the axle means in one direction of pivoting about the pivot axis as a result of adjustment of the control member in one direction of adjustment and thereby adjustably raising the front portion of the carriage relative to the subjacent surface to provide an adjustable mounting suitable for use with different pile height floor coverings.

The locking means may define separable interconnecting portions arranged to become separated as a result of inadvertent substantial force being applied downwardly on the nozzle which would otherwise tend to damage the positive connection between the control member and the axle mounting means portion. Further the nozzle may define a guide extending parallel to the wheel axis and means for carrying the control member for rectilinear movement along the guide to effect the adjustment. In the specific embodiment of the drawing, the control means includes a connector comprising a rectilinearly adjustable means on the nozzle, a force transmitting member pivotally carried by the carriage, and means connecting the adjustable means and force transmitting member to urge the force transmitting member adjustably against the axle means in one direction of movement of the force transmitting member. The connecting means illustratively comprises a link movably connected at one end to the adjustable means and at the other end to the force transmitting member.

Thus, the vacuum cleaner may be readily adjusted for different pile heights by simply moving the control member along a rectilinear guide on the top front of the nozzle to correspondingly swing the front wheels of the carriage away from the front of the carriage and thereby elevate the carriage as desired. The structure of the present invention is extremely simple and economical of construction while yet providing the desirable features discussed above.

BRIEF DESCRIPTION OF THE DRAWING

Other features and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawing wherein:

FIG. 1 is a perspective view of a vacuum cleaner having a nozzle adjustment means embodying the invention;

FIG. 2 is an enlarged bottom plan view thereof;

FIG. 3 is a vertical section taken substantially along the line 3—3 of FIG. 2;

FIG. 4 is a fragmentary enlarged vertical section taken substantially along the line 4—4 of FIG. 2;

FIG. 5 is a fragmentary top plan view of a portion of the vacuum cleaner structure taken substantially along the line 5—5 of FIG. 4;

FIG. 6 is a fragmentary section taken substantially along the line 6—6 of FIG. 4;

FIG. 7 is a perspective view of an adjustment catch member employed in the illustrated embodiment of the invention;

FIG. 8 is a fragmentary section of a portion of the structure of FIG. 6 with the nozzle adjustment control positioned for maximum elevation of the nozzle; and

FIG. 9 is a horizontal section taken substantially along the line 9—9 of FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the exemplary embodiment of the invention as disclosed in the drawing, a vacuum cleaner generally designated 10 is shown to comprise an upright vacuum cleaner having a nozzle 11, a bag housing 12, and a handle 13 for guiding the vacuum cleaner in normal use. The vacuum cleaner is movably carried on a carriage generally designated 14 having a pair of front wheels 15 and a pair of rear wheels 16. Nozzle 11 is swingably mounted for movement about the axle 17 of the fan motor 18 carried coaxially in a cylindrical housing 19 at the lower end of the bag housing 12, as shown in FIG. 3. The front portion 20 of the nozzle is biased downwardly by a pair of coil springs 21 connected between posts 22 on the nozzle and a front corner portion 23 on the carriage 14. The tension springs 21 are relatively light so that the nozzle tends to float with a brush and beater bar 24 thereof urged lightly downwardly against the subjacent carpet surface. As shown in FIG. 3, the brush and beater bar may be driven by a suitable belt 25 from the motor 18. The brush and beater bar is enclosed in an inlet housing 26 having a lower opening 27 through which air is drawn into the vacuum cleaner. A foot pedal 28 is mounted on one end of a cross shaft 29 journalled in the side plates 30 of the carriage for manipulating a latch 31 to selectively hold the bag housing 12 in a vertical storage position, as shown in FIG. 3.

As indicated briefly above, the present invention is concerned with means for adjusting the vacuum cleaner to different pile heights. Illustratively, the vacuum cleaner may be adjusted for use with low pile carpeting, shag carpeting, medium deep shag carpeting, and deep shag carpeting with in a plurality of different corresponding height dispositions by a novel control means generally designated 32. More specifically, as best seen in FIG. 2, the front wheels 15 are rotatably journalled on an axle 33 having outboard coaxial end portions 34 and retaining means 35 for removably retaining the wheels 15 on the end portions 34. The mid-portion 36 of the axle 33 is offset rearwardly from the end portions by connecting portions 37 and 38. Connecting portion 38 further includes a rearward extension 39 entending rearwardly through an opening 40 in an inclined front plate portion 41 of the carriage. Mid-portion 36 of the axle is pivotally journalled in a pair of forwardly projecting bracket legs 42 carried on front wall 41 such as by screws 43 (FIG. 6). Control of the height position is effected by swinging the wheel axle 33 about the pivot axis of mid-portion 36, as shown in FIG. 4, so as to raise or lower the front wheels 15. Swinging of the axle is effected by suitable movement of the rearward extension 39.

As shown in FIGS. 6 and 8, upward and downward movement of axle extension 39 is effected by cam member 44 having an upwardly facing camming surface 45 on which the axle extension 39 slidably rests. Cam 44 comprises a rearwardly formed portion of a pivot plate 46 having a pivot portion 47 pivotally mounted to the wall 41 as by a rivet 48. The wall 41 is provided with an arcuate slot 49 slidably receiving a rivet 50 for maintaining the pivot plate 46 in facial engagement with the rear surface 51 of wall 41.

Swinging movement of the pivot plate 46 is effected by a manual knob member 52 of control 32 received in a recess portion 53 of the nozzle front portion 20, as shown in FIG. 1. Nozzle recess portion 53 is provided with an elongated transverse slot 54. A pair of connectors 55 extend downwardly from knob 52 through slot 54 to guide the knob for transverse movement along the slot. A leaf spring 56 is disposed between the nozzle portion 53 and the lower end of the knob 52 to bias the knob upwardly of the nozzle front portion 20.

A mounting plate 57 is mounted on the lower end of the connectors 55 by means of suitable screws 58 (FIG. 6). A stabilizing slide bar 59 is mounted on the connectors below wall surface 72 and above mounting plate 57. Nozzle wall surface 72 is provided with a plurality of spaced downwardly projecting teeth 60 below slot 54 and mounting plate 57 carries a cooperating adjustment catch member 61 (FIG. 7) having spaced tooth-like projections 61*a* and 61*b* adapted to engage teeth 60 selectively and thereby selectively position the mounting plate 57 along the transverse slot 54. The catch member 61 is biased upwardly by the spring 56 to maintain the selected adjustment. However, to change the positioning of the mounting plate 57, the user merely urges the control knob 52 downwardly against the bias of spring 56 to move the catch member 61 away from teeth 60 and permitting transverse movement of the mounting plate 57 along slot 54 under the guiding action of connectors 55 in the slot to a new selected position of the mounting plate 57 whereupon release of the control knob 52 permits spring 56 to bring the catch member 61 again into locking engagement with the teeth 60.

The transversely adjusted position of the mounting plate **57** is transmitted to the pivot plate **46** by a suitable connecting link **62** having one turned end **63** received in an aperture **64** of a tab **65** on the mounting plate **57,** and an opposite turned end **66** received in a suitable aperture **67** in the distal end of the pivot plate **46.**

Thus, selective positioning of the control knob **52** longitudinally of slot **54** effects a corresponding pivotal positioning of pivot plate **46** and the cam member **44** therewith. As shown in FIGS. **6** and **8,** a clockwise movement of the pivot plate **46** swings camming surface **45** upwardly against the axle extension **39** thereby to lower the wheels **15** relative to the carriage **14** thereby raising the nozzle front portion **20.** As shown in FIG. **5,** the control knob **52** may be selectively positioned in a plurality of discrete transversely spaced positions corresponding to "Low Pile," "Shag," "Medium" and "Deep Shag" pile heights as indicated by the corresponding indicia **68** carried on the nozzle portion **53.** As the number of teeth **60** are greater than the indicated different designations, intermediate dispositions of the nozzle height may be effected. The control knob **52** may be provided with a forwardly projecting finger gripping portion **69** permitting the user to grasp portion **69** and by concurrently urging the control knob **52** downwardly, reposition the control knob transversely along the slot **54** as desired.

The toothed adjustment catch member **61** (see FIG. **7**) is preferably formed of a resilient plastic material, such as polyurethane which, together with the spring **56,** provides a positive locking engagement with teeth **60.**

The toothed adjustment catch member **61** may advantageously include a resilient projecting arm portion **61c** which cooperates with the teeth **60** to provide a sound like that emitted during operation of a ratchet as the catch member **61** is moved relative to the teeth **60** during adjustment of the nozzle. This ratchet-like sound constitutes an audible signal which positively informs the operator of the movement of the adjustment catch member **61** relative to the teeth **60** as control knob **52** is adjustably moved toward the selected position.

Thus, in use, the user merely raises the front of the nozzle **20** above the surface on which it rests and adjusts the position of control knob **52** to the desired selected pile height setting whereupon the axle **33** carrying the front wheels **15** is swung about the axis of portion **36** to raise or lower correspondingly the axis of axle portions **34** and thereby the wheels **15** rotatably mounted thereon. The setting of the wheels is releasably retained by the toothed engagement of members **61** and **60.** The nozzle is floatingly carried by means of the springs **21** to provide an improved accurate control of the carpet cleaning operation.

The control means is extremely simple and economical of construction while yet providing the improved accurate control as discussed above.

The foregoing disclosure of specific embodiments is illustrative of the broad inventive concepts comprehended by the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a vacuum cleaner having a carriage, front wheels, rear wheels rotatably carried by the carriage, a nozzle having a front portion and a top wall, means for carrying the nozzle on the carriage, and structure for adjusting the height of the front portion of the carriage relative to a subjacent surface on which said wheels are disposed including axle means for journalling said front wheels for rotation about a borizontal wheel axis, means mounting the axle means to said carriage for pivotal movement about a horizontal pivot axis parallel to and spaced from said wheel axis, a control member adjustably carried by the nozzle, locking means for releasably retaining the control member in any one of a plurality of different preselected adjusted positions, and improved means for positioning the axle means comprising a connector having a portion pivotally mounted on said carriage and means movably connected between said connector and said control member, said connector portion having a lower force transmitting member spaced substantially below said top wall substantially at the level of said wheel axis for engaging a portion of said axle means spaced from said pivot axis defining means for effectively positively pivoting said axle means in one direction of pivoting about said pivot axis as a result of adjustment of said control member in one direction of adjustment and thereby adjustably raising said front portion of the carriage relative to the subjacent surface to provide an adjustable mounting of the vacuum cleaner suitable for use with different pile height floor coverings.

2. The vacuum cleaner structure of claim **1** wherein said locking means defines vertically interconnecting portions.

3. The vacuum cleaner structure of claim **1** wherein said locking means defines vertically interconnecting teeth.

4. The vacuum cleaner structure of claim **1** wherein said connector portion comprises a cam pivotally carried by the carriage, said means connected to said control member comprises a link connected between said control member and said cam for adjustably pivoting the cam against said axle means, and means are provided for limiting the pivotal movement of the cam on said carriage.

5. The vacuum cleaner structure of claim **1** wherein said nozzle defines a guide extending parallel to said wheel axis and means for carrying sad control member for rectilinear movement along said guide to effect said adjustment of the carriage front portion.

6. In a vacuum cleaner having a carriage, front wheels, rear wheels rotatably carried by the carriage, a nozzle carried on the carriage and having a front portion and a top wall, and structure for adjusting the height of the front portion of the carriage relative to a subjacent surface on which said wheels are disposed including axle means for journalling said front wheels for rotation about a horizontal wheel axis, means mounting the axle means to said carriage for pivotal movement about a horizontal pivot axis parallel to and spaced from said wheel axis, a control member adjustably carried by the nozzle, locking means for releasably retaining the control member in any one of a plurality of different preselected adjusted positions, and improved means for positioning the axle means comprising a connector having a portion pivotally mounted to said carriage and means movably connected between said connector and said control member, said connector portion defining lower cam means spaced substantially below said top wall substantially at the level of said

wheel axis for engaging a portion of said axle means spaced from said pivot axis defining means for effectively positively pivoting said axle means to swing said front wheels downwardly about said pivot axis as a result of adjustment of said control member in one direction of adjustment and thereby adjustably raise said front portion of the carriage relative to the subjacent surface.

7. The vacuum cleaner structure of claim **6** wherein said control member comprises rectilinearly adjustable means on said nozzle, and said means connected to the control member comprises means connecting the adjustable means and force transmitting member to urge the force transmitting member adjustably against said axle means in one direction of movement of the force transmitting member.

8. The vacuum cleaner structure of claim **6** wherein said force transmitting member comprises a cam pivotally carried by the carriage.

9. The vacuum cleaner structure of claim **6** wherein said control member comprises rectilinearly adjustable means on said nozzle, and said means connected to the control member comprises means connecting the adjustable means and force transmitting member to urge the force transmitting member adjustably against said axle means in one direction of movement of the force transmitting member, and means slidably connecting the force transmitting member to the carriage along an arc spaced from the axis of pivoting of the force transmitting member for maintaining movement of the force trasnmitting member parallel to a single plane.

10. The vacuum cleaner structure of claim **6** wherein said control member comprises rectilinearly adjustable means on said nozzle, and said means connected to the control member comprises a link movably connected at one end to said adjustable means and movably connected at the other end to the force transmitting member to urge the force transmitting member adjustably against said axle means in one direction of movement of the force transmitting member.

11. The vacuum cleaner structure of claim **7** wherein said adjustable means includes a rectilinear guide carried by the nozzle, a slide movably engaging the guide, first locking tooth means carried by the nozzle adjacent the guide, and second locking tooth means carried by the slide in engagement with said first tooth means, at least one of said tooth means being yieldable.

12. The vacuum cleaner structure of claim **7** wherein said adjustable means includes a rectilinear guide carried by the nozzle, a slide movably engaging the guide, first locking tooth means carried by the nozzle adjacent the guide, and second locking tooth means carried by the slide in engagement with said first tooth means.

13. The vacuum cleaner structure of claim **1** wherein said second locking tooth means carried by the slide is a toothed adjustment catch member formed of a resilient plastic material.

14. The vacuum cleaner structure of claim **13** wherein said adjustment catch member includes means cooperating with said first locking tooth means to provide an audible signal as said control member is adjustably moved relative to said nozzle.

* * * * *

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,848,292 Dated November 19, 1974

Inventor(s) ERWIN E. NORDEEN and CLIFFORD H. OLSON

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, Claim 1, line 6, before "wheel" correct the spelling of "borizontal" to --horizontal--; and in line 15, before "said carriage" cancel "on" and substitute therefor --to--.

Column 6, Claim 5, line 45, after "carrying" correct the spelling of "sad" to --said--.

Column 7, Claim 9, line 31, before "member" correct the spelling of "trasnmitting" to --transmitting--.

Column 8, Claim 13, line 22, after "claim" cancel "1" and substitute therefor --12--.

Signed and sealed this 29th day of April 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
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