June 28, 1949. H. B. WHITE 2,474,448

SEMIAUTOMATIC NOZZLE ADJUSTMENT FOR SUCTION CLEANERS

Filed May 5, 1943 4 Sheets-Sheet 1

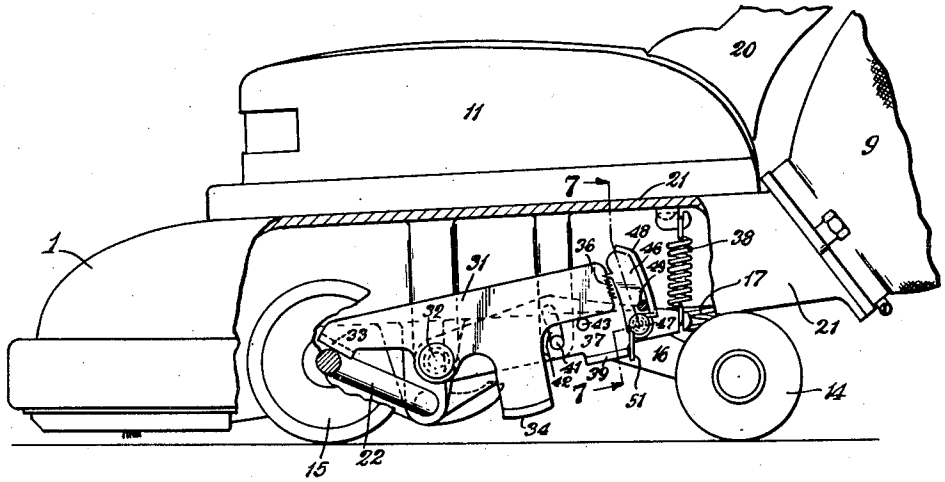


Fig. 1

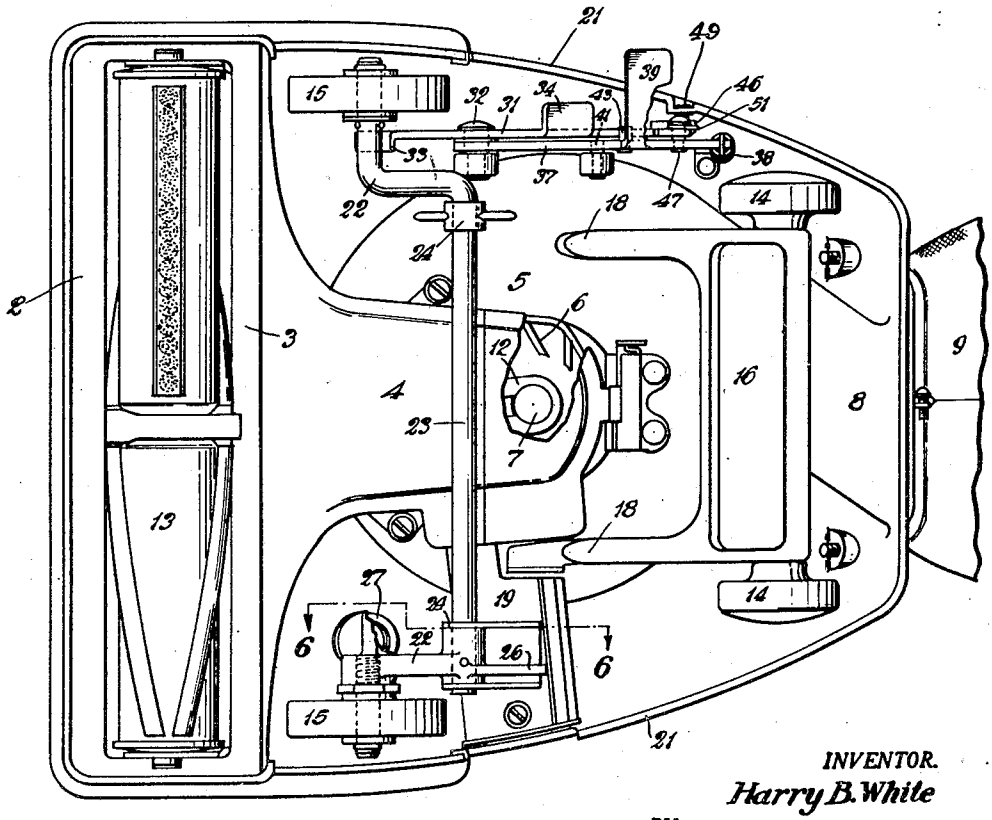


Fig. 2

INVENTOR.
Harry B. White

BY
Harry S. Dumars
ATTORNEY

June 28, 1949. H. B. WHITE 2,474,448

SEMIAUTOMATIC NOZZLE ADJUSTMENT FOR SUCTION CLEANERS

Filed May 5, 1943 4 Sheets-Sheet 2

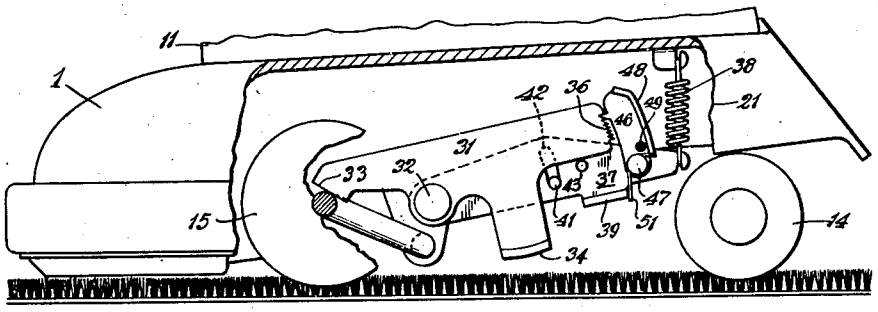


Fig. 3

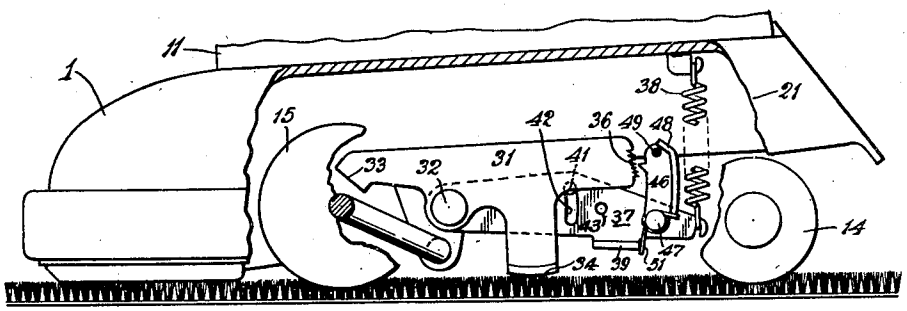


Fig. 4

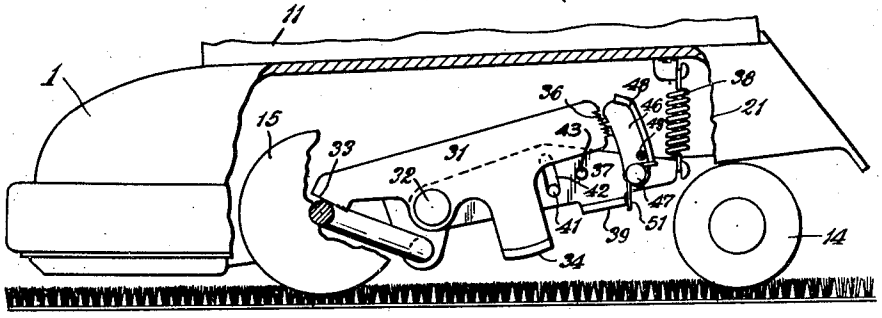


Fig. 5

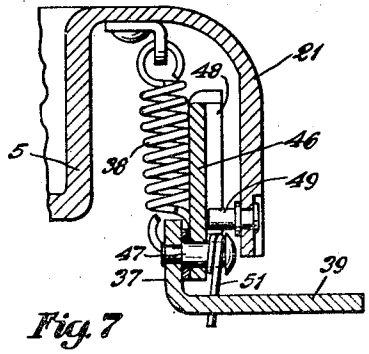
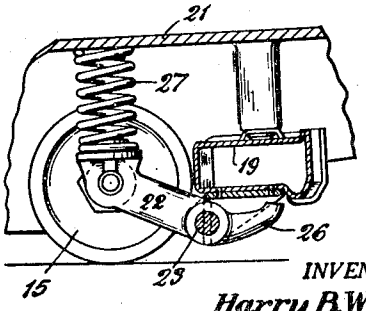


Fig. 7

Fig. 6



INVENTOR.
Harry B. White

BY
Harry S. Duncan
ATTORNEY

June 28, 1949. H. B. WHITE 2,474,448

SEMIAUTOMATIC NOZZLE ADJUSTMENT FOR SUCTION CLEANERS

Filed May 5, 1943 4 Sheets-Sheet 3

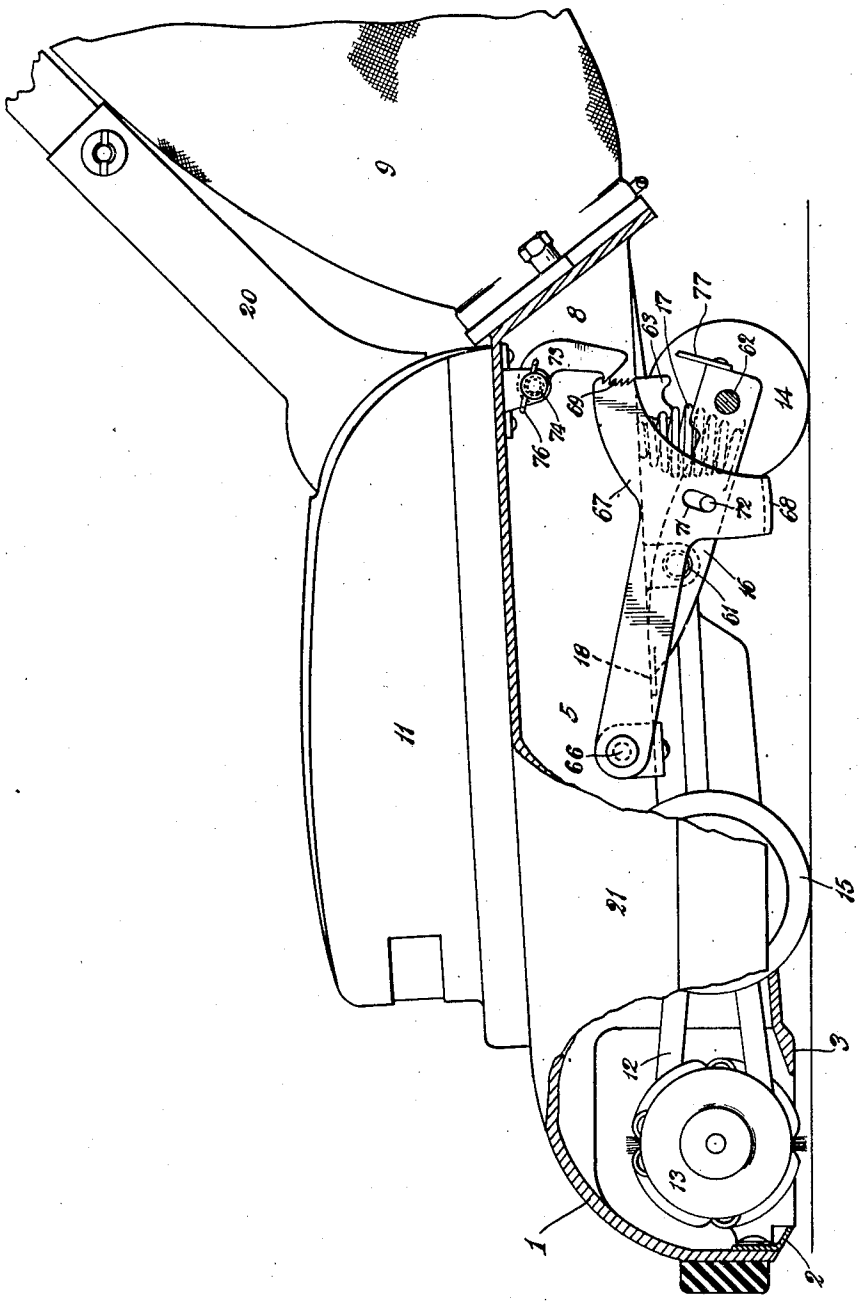


Fig. 8

INVENTOR.
Harry B. White
BY
Harry S. Bucarse
ATTORNEY

June 28, 1949. H. B. WHITE 2,474,448

SEMIAUTOMATIC NOZZLE ADJUSTMENT
FOR SUCTION CLEANERS

Filed May 5, 1943 4 Sheets-Sheet 4

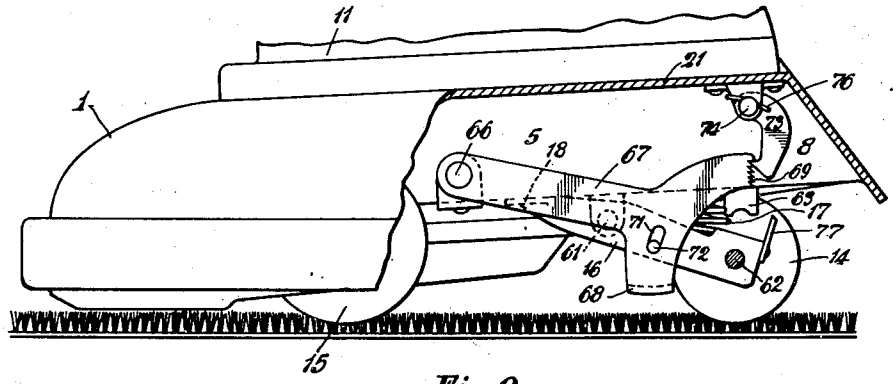


Fig. 9

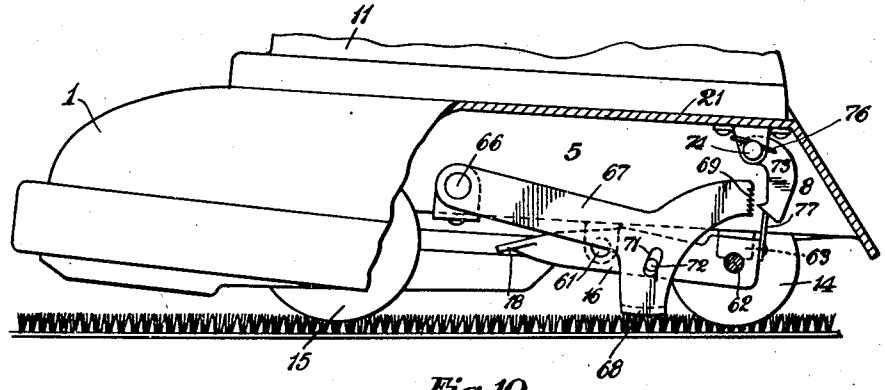


Fig. 10

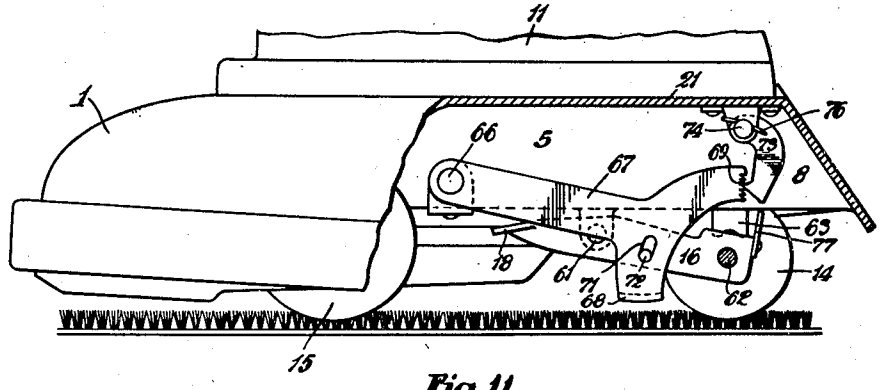


Fig. 11

INVENTOR.
Harry B. White
BY
Harry E. Dumark
ATTORNEY

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2,474,448

UNITED STATES PATENT OFFICE

2,474,448

SEMIAUTOMATIC NOZZLE ADJUSTMENT FOR SUCTION CLEANERS

Harry B. White, Canton, Ohio, assignor to The Hoover Company, North Canton, Ohio, a corporation of Ohio

Application May 5, 1943, Serial No. 485,688

18 Claims. (Cl. 15—358)

1

The present invention relates to suction cleaners in general and more particularly to a new and novel height adjustment for a suction cleaner. More specifically, the invention relates to a semi-automatic nozzle height adjustment in which a cleaner is automatically positioned properly for cleaning upon a supporting surface covering by the operator merely exerting an unmeasured force upon the cleaner or upon some part thereof, no judgment upon the part of the operator being required.

It is an object of the present invention to provide a new and improved suction cleaner. It is another object of the invention to provide new and improved semi-automatic nozzle height adjustment in a suction cleaner. A still further object of the invention is to provide a suction cleaner of the type having means to adjust the nozzle automatically for efficient cleaning upon a covering which supports it upon the reception of an unmeasured actuating force from the operator. A still further object of the invention is to provide a suction cleaner having semi-automatic nozzle-height-adjusting means which are characterized by the inclusion of a surface covering gauge or feeler which does not support the cleaner and which functions, during nozzle height adjustment only, to determine the plane of the top of the surface covering. A still further object of the invention is to provide a semi-automatic nozzle height adjustment in which the receipt by the cleaner of an operator-exerted actuating force results in the lowering of a feeler to determine the top plane of the surface covering to be cleaned and which effects the proper relationship of the adjustment parts so that the cleaner is properly positioned to clean upon the supporting covering. A further object of the invention is to provide a semi-automatic nozzle height adjustment in which a downward force exerted upon the machine proper produces a readjustment of the nozzle height in accordance with the characteristics of the supporting surface covering. A still further object of the invention is to provide a suction cleaner in which a downward force upon the cleaner body results in the release of a surface covering gauge or feeler which determines the top plane of the surface covering and which repositions the nozzle height adjustment mechanism so that when returned to operation the nozzle is properly positioned. These and other more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith the attached drawings to which they relate.

2

Referring now to the drawings in which prefered embodiments of the invention are disclosed:

Figure 1 is a side view of a suction cleaner constructed in accordance with the present invention positioned upon a bare surface or very thin covering, certain parts being broken away to illustrate the semi-automatic nozzle height adjustment;

Figure 2 is a bottom view of the cleaner illustrated in Figure 1;

Figure 3 is a partial side view of the cleaner illustrated in Figure 1 when removed to a thick surface covering and without a re-adjustment of the nozzle height;

Figure 4 is a view similar to Figure 3 and illustrates the relationship of parts during the adjustment with the top plane of the surface covering being gauged by the surface covering feeler;

Figure 5 is a view similar to Figure 3 but with the nozzle height adjusted and the nozzle lifted to proper cleaning position for the underlying supporting covering;

Figure 6 is a view looking in the direction of the arrows upon the line 6—6 of Figure 2.

Figure 7 is a vertical section upon the line 7—7 of Figure 1;

Figure 8 is a side elevation, with certain parts broken away, showing a suction cleaner constructed in accordance with a second preferred embodiment of the invention, the nozzle height being properly positioned for cleaning upon the very thin supporting covering or bare surface;

Figure 9 is a partial side view of the cleaner illustrated in Figure 8 when moved onto a thicker supporting surface and without readjustment of the nozzle height;

Figure 10 is a view similar to Figure 9 but shows the cleaner during the nozzle re-positioning operation with the rear of the machine depressed and the surface covering gauge determining the top plane of the surface covering; and

Figure 11 is a view similar to Figure 9 with the downward force upon the machine removed and with the nozzle height adjustment parts re-engaged and the nozzle positioned at the proper height for cleaning upon a supporting surface.

Early forms of nozzle height adjustments for suction cleaners comprised manually adjustable means in which the degree of adjustment was determined by the judgment of the operator. A suction cleaner is a relatively low device positioned close to the supporting surface and in order to make such an adjustment the operator was required to bend over the machine and, while in this rather uncomfortable position, to operate an adjustment which produced the raising or

the lowering of the nozzle into a position which, in his opinion, was proper for the surface covering to be cleaned. Usually, because of the difficulty of making the adjustment, the adjustment was not made and when made was frequently rough and inaccurate.

In the suction cleaner constructed in accordance with the present invention, the nozzle height adjustment is entirely independent of the judgment of the operator. The machine incorporates means or mechanisms which, upon receiving an unmeasured actuating force from the operator, functions to readjust the position of the cleaner nozzle relative to the supporting surface and in accordance with determinations automatically made during the adjustment. The change in nozzle position is independent of the operator's judgment and the amount of force received.

Semi-automatic nozzle height adjustments in the past have usually made use of the nozzle itself as the means to gauge or determine the plane of the top of the supporting surface. The nozzle lips are relatively wide and are capable of supporting the front end of the machine with but relatively little sink into the supporting covering but there inevitably will be some. In the semi-automatic nozzle height adjustment constructed in accordance with the present invention a surface covering gauge or feeler is provided which does not support the weight of the cleaner or any part thereof when making its determination as to the top plane of the underlying surface covering. The receipt of the actuating force from the operator results in the lowering of the gauge or feeler into contacting relationship with the surface covering and its determination of the surface covering position is unaffected by the downward force of gravity acting upon the cleaner as in the earlier semi-automatic nozzle height adjustments of this type.

Referring again to the drawings, and to Figures 1 to 7 inclusive in particular, the first preferred embodiment of the invention is illustrated and is seen to comprise a suction cleaner which includes the nozzle 1 provided with surface-contacting lips 2 and 3. Nozzle 1 is interiorly connected through an air passageway 4 to a fan chamber 5 which houses a rotating suction-creating fan 6 carried by the extended lower end of a motor shaft 7. Fan 6 draws cleaning air through the nozzle 1 and exhausts it from the fan chamber 5 via the exhaust outlet 8 into a removably attached dust bag 9. The driving motor is unshown but is positioned within the motor hood 11 immediately above the fan chamber 5 and the extreme lower end of its shaft 7 is formed as a pulley surface which drives a power-transmitting belt 12 connected to the agitator 13 in the nozzle 1. Agitator 13 includes both rigid beater elements and flexible brush elements and is adapted, in the cleaning of the surface covering, to brush and beat, for the purpose of dislodging foreign material therefrom, a surface covering which is lifted by the nozzle suction into contact with the lips 2 and 3.

The cleaner is movably supported upon front wheels 15 and rear wheels 14. The latter are pivotally carried upon the underside of the machine upon a bracket 16, the forwardly extending arms of which abut the underside of the fan chamber 5, being normally held thereagainst by the downward force exerted by a coil spring 17 between the rear of the pivoted bracket and the underside of the fan chamber 5. One of the forwardly extending arms of the bracket 16, which arms are indicated at 18, normally extends in obstructing relationship into a transversely extending passageway 19 connected to the fan chamber 5 which is adapted to receive and seat the converter element of a dusting tool unit when the machine is in use as an off-the-floor cleaner. The spring 17 and the mounting bracket 16 are largely concealed, when the machine is viewed from above, by the presence of skirts 21 which extend around the sides of the machine from the ends of the nozzle 1.

As in the usual cleaner a pivoted handle, indicated at 20, is provided by which the machine can be propelled upon the supporting wheels 15 and 14.

In this first embodiment of the invention it is the front wheels 15 which are adjustably positioned with respect to the cleaner body and which are vertically adjusted by the semi-automatic nozzle-height-positioning means to provide the proper nozzle height adjustment. Front wheels 15 are pivotally carried upon arms 22 of a crank shaft 23 which is pivotally mounted upon the underside of the machine in bearings 24. One of the arms 22 is formed with a rearwardly projecting abutment 26 which is adapted to contact the underside of the converter passageway 19 to limit the downward movement of the wheels 15 under the actuation of a coil spring 27 which abuts against the arm 22. Spring 27 is not sufficiently strong to support the entire weight of the front of the machine upon the supporting wheels 15 but has sufficient strength to force the wheels 15 to a firm foundation in the supporting covering when the front wheels are released from their normal cleaner-supporting function as is clearly illustrated in Figure 4. Consequently, surface-contacting lips 2 and 3 readily support that portion of the weight not supportable by spring 27 with very slight or no penetration of the carpet during adjustment of the nozzle.

Adjacent one front supporting wheel 15, and in contact with the arm 22 upon which it is mounted, is a pivoted feeler-lever 31. Lever 31 is pivotally carried by horizontal pin 32 on the underside of the cleaner casing and its forward end is formed as an abutment 33 which is adapted to contact the arm 22. Rearwardly of its pivot pin 33 feeler lever 31 extends downwardly and is formed with a smooth surface 34 which is adapted to contact and rest upon the top plane of an underlying surface covering when a nozzle height adjustment is being made. Surface 34 is of sufficient area to support the feeler element 31 without appreciable penetration into the supporting surface. At its rearward end lever 31 is formed as a toothed surface 36 which extends substantially vertically, its exact curvature not being of the essence so long as there is a vertical spread between its upper and lower extremities.

Also pivoted upon the pin 32 is a pedal or foot lever 37 which extends rearwardly beyond the toothed surface 36 to have its end connected to a coil spring 38 which is supported from the underside of the overlying skirt 21 and which at all times draws the foot lever 37 upwardly. Lever 37 is formed forwardly of the spring 38 with a pedal extremity 39 which extends outwardly and below the adjacent skirt 21 to the side of the cleaner where it is adapted to receive a downward force exerted by the operator. A laterally extending fixed pin 41 fits slidably within a slot 42 in the foot lever 37 and limits the downward movement thereof under an operator-exerted force and also limits its upward movement under

the action of the coil spring 38. Lever 37 itself carries an outwardly extending abutment pin 43 which serves as stop means for the rear end of the feeler lever 31 under certain conditions as will become apparent.

A pawl 46 is pivoted upon a pin 47 on the foot lever 37 and is so constructed and arranged as to engage the toothed surface 36 of the feeler lever 31. Toothed end 36 of lever 31 cooperates with pawl 46 to provide a selectively engageable clutch as will become fully apparent hereinafter. Pawl 46 is provided with a ramp surface 48 which rides a fixed pin 49 carried on the body of the cleaner, being spring-held thereagainst at all times by the action of a coil spring 51 seated upon its pivot pin 47. Ramp 48 is so contoured that at its end, as the lever 37 is pivoted, the pawl 46 is cammed toward or from the toothed surface 36 of feeler lever 31, depending upon whether the foot lever 37 is moving up or down, respectively. In the normal operation of the machine, the foot lever 37 is held in its uppermost position at its rear end by the action of the spring 38 the upper end of which is connected to the cleaner body. Also, the pawl 46 is in engagement with the toothed surface 36 of the feeler lever 31, and the front wheels 15 are positioned by the contact of the lever abutment surface 33 with the wheel-carrying arm 22.

The adjustment of the nozzle height of a cleaner constructed in accordance with this first embodiment of the invention is accomplished as follows: The cleaner having been in operation upon a very thin surface covering or bare floor, as illustrated in Figure 1, has its nozzle positioned relative to the supporting surface as shown in that figure. Let us assume that the machine is then propelled onto a thicker surface covering. The mouth of the nozzle, that is, the plane of the nozzle lips 2 and 3, will now be too low and the relationship will be as illustrated in Figure 3. The machine will be hard to propel and effective cleaning will be impossible as there is insufficient room to lift the carpet the desired distance above the supporting surface underlying the covering for the most effective cleaning, particularly when using a rotating agitator. These facts will readily be apparent to the operator who thereupon exerts a downward force upon the extremity 39 of the pedal or foot lever 37. As the pedal 37 is forced downwardly in opposition to spring 38, pawl 46 of the clutch is cammed rearwardly under the action of the ramp 48 on its guiding pin 49, and disengages the toothed portion 36 of the feeler lever 31. Feeler lever 31 then pivots downwardly into contact, at its surface-contacting portion 34, with the top of the underlying surface covering and the relationship of the parts is as illustrated in Figure 4. Under these conditions, the cleaner weight is carried by the rear supporting wheels 14 and by the nozzle lips 2 and 3. The front supporting wheels 15, being relieved of the load imposed by spring 38 upon the release of the lever 31, rest upon the surface covering and penetrate thereinto under the action of the coil spring 27 so as to seat firmly in the covering.

The pivot pin 32 of the foot lever 37 is carried by the cleaner body which, during the adjustment operation, is supported by the front lips 2 and 3 and by the rear wheels 14. The broad front lips 2 and 3 will not sink appreciably into the covering but the rear wheels 14 will penetrate to different extents in different types of covering. In Figure 1, for example, the rear wheel 14 was upon

the top of a bare surface or a very thin covering. In Figure 3, however, wheel 14 is observed to penetrate appreciably into the relatively thick covering. Accordingly, upon a very thick covering the pivot pin 32 will be lower relative to the top plane of that supporting surface than upon a thin covering. In either case, however, the surface-contacting portion 34 of the feeler lever 31 will rest upon the top surface and without appreciable penetration therein. It is clear, therefore, that the angularity of the feeler lever 31 relative to the cleaner body during the adjustment operation will be determined by the relative heights of the pivot pin 32 and the contact surface 34. If the covering is very thin the toothed portion 36 at the rear of the lever 31 will be lower than upon a thick covering.

Referring again to Figure 4 which shows the cleaner at the mid-point of its adjustment operation, the feeler 34 is resting immediately upon the top of the covering and the pedal-carried pawl 46 is out of contact with the toothed surface 36 of the lever 31, the pedal 37 being held in the lower position by the operator. The operator can now remove the downward force and permit the foot lever 37 to be pulled upwardly toward the cleaner body under the action of the spring 38. As the lever moves upwardly the pawl 46 is first cammed toward the toothed surface 36 by the action of the ramp 48 riding the guide pin 49 against which it is held by the torsion spring 51. The clutch selectively re-engages when pawl 46 engages the toothed surface 36 at a point dependent upon the angular position of the lever 31. Thus, the rear wheel 14 has sunk appreciably into the surface covering, thereby indicating a deep soft covering, the lever 31 will be positioned at a relatively high position with respect to the cleaner body and the pawl 46 will engage the toothed surface 36 near the bottom thereof. On a very thin covering, however, lever 31 would be relatively low and pawl 46, upon being cammed into engagement with the toothed surface 36, would engage it near the top, as in Figure 1. Clearly the pawl engages the toothed surface selectively as determined by the position of the feeler lever 37 which position is in turn determined by the type of covering upon which the machine rests at the time the nozzle height adjustment is made.

The pawl 46 having engaged the toothed surface 36 of feeler-lever 31, the continued upward movement of the pedal 37 under the actuation of the tension coil spring 38 results in the feeler-lever 31 being pivoted in a counter-clockwise direction, as viewed in Figures 1, 3, 4, and 5. The forward or abutment end 33 of lever 31 contacts the crank arm 22 and forces that arm and the wheels 15 connected thereto downwardly resulting in the raising of the nozzle. This downward movement of the supporting wheels continues until the slot 42 in the pedal 37 contacts the fixed pin 41 which prevents further pivotal movement of the foot lever. The parts remain in this position until the next adjustment and the cleaner is in condition for operation.

Figures 8 to 11 illustrate another embodiment of the invention. The cleaner construction generally is identical to that of the first embodiment, the differences residing in the nozzle-height-adjusting means. The same parts of the cleaner are indicated by the same reference characters as in the first embodiment. It is to be noted, however, that the front wheels are fixedly mounted to the cleaner body in any suitable man-

ner, the adjustment being initiated by a force exerted downwardly upon the rear of the machine, either through the pivoted, cleaner propelling handle 20 or upon the main casing itself.

In this embodiment of the invention the rear wheels 14 are carried by bracket 16 which is pivotally mounted upon the under side of the cleaner by a pin 61. As in the first embodiment a coil spring 17 urges the bracket downwardly and the forwardly extending arms 18 underlie the fan chamber. A transverse shaft 62 rotatably mounts the wheels 14 upon the bracket 16 and an abutment seat or shoulder 63 is provided upon the underside of the exhaust outlet 8 to limit the upward movement of the wheels 14 toward the cleaner body.

Pivoted at the side of the fan chamber 5 upon a pin 66 is a feeler-lever 67 provided with a surface-contacting portion 68 and a rear toothed portion or clutch element 69. In its general outline feeler-lever 67 is very similar to feeler-lever 31 of the first embodiment, save only the absence of the crank arm-abutting forward portion. As is true of feeler 31, member 67 acts as a freely floating feeler having one part pivoted to the cleaner body and a surface contacting part 68 adapted to float on the surface of the carpet when the clutch is disengaged. Immediately above the surface-contacting portion 68 the feeler lever 67 is formed with a slot 71 into which extends a pin 72 rigid with the wheel-carrying bracket 16. With the rear of the machine depressed so that the abutment 63 contacts the wheel axle 62 the slot 71 is of sufficient extent to permit the feeler lever 67 to assume an augular position relative to the cleaner body as determined by the contact of its surface-contacting portion 68 with the underlying supporting surface.

To cooperate with the toothed clutch portion 69 of the feeler lever 67 in fixing the height of the rear wheels 14 relative to the cleaner body in operation, there is provided a cooperating clutch element comprising a pawl 73 which is pivoted upon a pin 74 on the underside of the cleaner body skirt 21. A torsion spring 76 at the pivot pin 74 at all times urges pawl 73 toward the toothed surface 69 of the feeler lever 67. The adjustment construction is completed by the presence of a ramp 77 at the back edge of the bracket 16 which is so positioned as to move into engagement with the lower, cammed end of the pawl 73 to disengage the clutch pawl from the toothed surface 69 as the rear of the machine is forced downwardly from the position illustrated in Figure 9 to that illustrated in Figure 10. With the clutch thus disengaged, it is clear that the feeler lever 67 will be free to rest upon the supporting surface, as illustrated in Figure 10.

The adjustment of the height of the nozzle in a suction cleaner embodying nozzle-height-adjusting means constructed in accordance with this last described embodiment of the invention is as follows. Starting with the machine upon a bare surface or very thin rug, as illustrated in Figure 8, the height of the nozzle is determined by the locking action of the pawl 73 with the toothed portion 69 of lever 67. Lever 67 is urged downwardly by its pin and slot connection at 71, 72 with the wheel-carrying bracket 16 which is directly urged downwardly by the spring 17. Actually, upon a bare surface, the nozzle is in its lowermost position and the forward arms 18 may be in abutment with the underside of the fan chamber 5, thereby limiting further downward movement of the rear wheels 14 in addition to the restraint of the pawl 73. This is incidental, however.

Let us assume that the machine is moved from the thin covering or bare surface of Figure 8 to a deeper and thicker surface covering as illustrated in Figure 9. The nozzle is now too low for proper cleaning and this fact being recognized by the operator, he exerts a depressing force upon the rear of the machine, either through the cleaner handle or upon the rear of the cleaner casing. As the machine casing moves downwardly, compressing the coil spring 17, the bracket 16 and rear wheels 14 move upwardly. In so doing, ramp 77 contacts the sloped lower end of pawl 73 and cams it from the toothed surface 69 to the position illustrated in Figure 10. Thereupon the feeler 67 drops downwardly and its surface-contacting portion 68 rests upon the top plane of the underlying surface covering. As in the first embodiment the relative angular position of the feeler-lever relative to the cleaner body will be determined by the relative displacement between the supporting means and the top surface of the surface covering as determined by the feeler. On a very deep or thick rug the rear of the feeler-lever will be held relatively high by the supporting surface, the supporting wheels sinking appreciably into the covering, whereas on a thin surface the supporting wheels will not sink so far into the covering and the toothed surface at the rear of the feeler lever 67 will be relatively low. As distinguished from the first embodiment, however, the nozzle does not rest upon the surface covering during the adjusting operation but instead is elevated as shown in Figure 10.

The plane of the top of the surface covering having been determined by the feeler-lever 67, the downward force upon the rear of the casing is then withdrawn. The rear of the machine moves upwardly and the pawl 73 is urged, by the spring 76, into contact with the toothed surface 69. Thereafter the bracket 16 and rear wheels 14 move downwardly under the actuation of the coil spring 17 until the pin 72 contacts the lower end of the slot 71 in the feeler-lever 67. The pivotal movement downwardly of the feeler-lever 67 being prevented by the pawl 73, the wheel-carrying bracket 16 is then locked in position.

In the event that the feeler-contacting surface 68 determines that the plane of the top surface of the supporting covering was relatively low, that is, the surface was bare or was covered by a very thin surface covering, the pawl 73 would contact the toothed surface 69 near the top thereof and the wheel-carrying bracket 16 would be permitted to move downwardly a considerable distance before being stopped by the contact of pin 72 with the bottom of slot 71. In a case, however, where the surface-contacting feeler 68 determines that it was upon a thick and deep rug, and that the top surface thereof was relatively high as compared to the position of the supporting wheels, then the pawl 73 would contact the toothed surface 69 near the lower end thereof and the wheel-carrying bracket 16 would be limited to much more restricted downward movement.

As contrasted with the first embodiment the release of the operator-exerted force results in the lowering of the nozzle to an extent determined by the engagement of the nozzle-height-adjusting elements. In the first embodiment, the release of the operator-exerted force resulted in the raising of the nozzle a pre-determined dis-

tance. In both adjustments, however, the final position of the nozzle is determined by the relative position of adjustment parts as determined, during the exertion by the operator of a downward force, by gauging the relative heights of the top surface of the surface covering to be cleaned and of certain parts of the machine.

I claim:

1. In a suction cleaner, a body including a nozzle having a lip, said nozzle adapted to rest upon a surface during the adjusting operation, a wheel, means pivotally mounting said wheel on said body, a lever to force said means downwardly and including a surface-contacting portion adapted to rest substantially on the top of an underlying surface to position said lever relative to said body in a released condition and while resting on a supporting surface free of the weight of said body, a foot pedal, cooperating clutch means on said lever and pedal to connect said parts for joint movement and to disconnect said parts for independent movement, means to open said clutch upon the downward movement of said pedal under an operator exerted downward force to enable the surface contacting portion of said lever to drop onto the surface free from the weight of said body and to close said clutch upon the upward movement of said pedal, and means to effect the upward movement of said pedal to close said clutch selectively under the control of the surface contacting portion and to effect the joint movement of said pedal and lever to adjust said wheel relative to said body, whereby the nozzle is raised above its position on the surface to an extent determined by the nozzle height adjusting elements for optimum cleaning condition.

2. In a suction cleaner, a body including a nozzle having a lip, a wheel, means pivotally mounting said wheel on said body, a lever to force said means downwardly and including a surface-contacting portion adapted to rest substantially on the top of an underlying surface to position said lever relative to said body in a released condition free of the weight of said body and a toothed portion, a foot pedal, a pivoted pawl on said pedal adapted to seat selectively on said toothed portion as determined by the position of said lever at the time of engagement and while resting upon an underlying surface, means to effect engagement of said pawl with said toothed portion upon the movement of said pedal in one direction and to effect disengagement upon the movement of said pedal in the opposite direction to enable said lever to drop freely at its surface-contacting portion onto an underlying surface covering, and means to move said pedal to engage said pawl with said toothed sector and thereafter move said lever.

3. In a suction cleaner, a body including a nozzle, a supporting wheel, a bracket pivotally mounting said wheel on said body, spring means urging said bracket away from said body, a feeler element pivoted on said body and adapted to be supported by an underlying surface in a disengaged condition, means providing a lost motion connection between said bracket and said feeler element, selectively engageable means interconnecting said body and said feeler element operative when engaged to fix the position of said wheel relative to said body, and means to compress said spring and disengage said selectively engageable means and release said feeler element upon the exertion by the operator of a downward force on said body, whereby upon removal of the operator applied force said spring means operates to separate said wheel from the body by an increment depending upon the point of reengagement of said selectively engageable means as determined by said released feeler.

4. In a suction cleaner, a body including a nozzle, a supporting wheel, a bracket pivotally mounting said wheel on said body, spring means operatively connected to the body and the bracket for urging said bracket away from said body, a feeler element pivoted on said body and adapted to be supported by an underlying surface in a disengaged condition and to be raised thereabove, said feeler element including clutch means, means providing a lost motion connection between said bracket and said feeler element, cooperating clutch means carried by said body to engage said feeler element clutch means selectively to fix the position of said wheel relative to said body, and means to compress said spring and disengage said clutch to enable said feeler element to drop onto an underlying supporting surface in response to a downward force on said cleaner body, whereby upon removal of said downward force said spring means operates to lower said wheel relative to the body by an increment depending upon the point of re-engagement of said cooperating clutch means as determined by said released feeler.

5. In a suction cleaner, a body including a nozzle, a wheel to support said body upon a surface covering, and means to adjust said wheel relative to said body in accordance with the characteristics of said covering comprising an adjustable connection between said wheel and said body, positioning means normally securing said connection in a fixed relationship to said body during cleaner operation and including a feeler element pivoted to said cleaner and operable when released to rest on an underlying surface independent of the weight of said cleaner, means to release said positioning means and said feeler element to enable the latter to drop freely upon a supporting surface, spring-actuated means to re-engage said positioning means selectively as determined by the position of said feeler element when resting upon a supporting surface and move said positioning means and said nozzle to their new positions as predetermined by the engagement of said spring-actuated means with said positioning means.

6. In a suction cleaner, a body including a nozzle having lips, a wheel, operator-operable nozzle adjusting means operable to adjust said nozzle to a predetermined height above a surface to be cleaned including mounting means movably mounting said wheel on said body, means to position said wheel relative to said body comprising a feeler-lever operatively mounted on the body and arranged to contact and control the position of said mounting means upon release of an operator-applied force on the nozzle-adjusting means and including a surface-contacting portion adapted to rest substantially on the top of an underlying surface, cooperating clutch means operatively mounted on the cleaner with respect to the feeler-lever to engage said feeler-lever in its position at rest upon an underlying surface, means to disengage said clutch means upon the application of an outside force to said nozzle adjusting means to enable said lever to drop onto a supporting surface free from the weight of said body, and means arranged to effect re-engagement of said clutch means selectively under the control of the surface-contacting por-

tion upon release of the operator-applied force from the nozzle adjusting means and to move said lever to a position as determined by its position when re-engaged by said clutch means, the position of said lever determining the position of said nozzle.

7. In a suction cleaner, a body including a nozzle, a supporting wheel, and means adjustably mounting said wheel with respect to said body to control the position of said nozzle relative to the surface of a floor covering, said means comprising a movable connection between said wheel and said body, a selectively engageable connection between said body and said movable connection to limit the movement of said wheel in one direction relative to said body, said selectively eingageable connection including a floating surface contacting feeler connected to one part thereof and adapted to rest on the surface of a floor covering when said nozzle is to be adjusted, said adjustable connection including spring means arranged to bias said adjustable wheel in one direction relative to said body, and manually operable means to increase the stress on said spring and disengage said selectively engageable connection momentarily to permit said feeler to rest on said floor covering and support said one part a predetermined distance thereabove, said selectively engageable connection being operable under power from said stressed spring as said manually operable means is released to re-engage at a point dependent on the position of said feeler relative to the cleaner body and adjust said supporting wheel with respect to said body.

8. In a suction cleaner, a body including a nozzle, a supporting wheel, vertically adjustable means mounting said wheel on said body, a first and a second lever pivoted to said body, selectively engageable clutch means interconnecting said levers normally operative to prevent relative movement therebetween in one direction, said first lever having an end positioned to adjust said wheel in one direction, spring means interconnecting said body and said second lever and operative through said clutch and said first lever to bias said wheel in said one direction, said first lever having a feeler portion adapted to rest on a floor covering when said clutch is disengaged, and means to disengage said clutch momentarily to permit said feeler to rest on said floor covering and to re-engage said clutch while said feeler is in said rest position.

9. A suction cleaner as defined in the preceding claim including means providing a lost motion connection between said body and said second lever.

10. In a suction cleaner, a body including a nozzle, rear wheel means for said body, a pair of front wheels, means movably connecting said front wheels to said body, selectively adjustable means interposed between said movable front wheels and said body including a spring operable to bias said front wheels in one direction relative to said body, said selectively adjustable means including a releasable feeler arranged to rest on the surface of a floor covering independent of the cleaner weight and to take a position relative to said cleaner body which is dependent upon the penetration of one of said wheels into said floor covering, and means for disconnecting said selectively adjustable means from said front wheels and for releasing said feeler momentarily whereby said selectively adjustable connection is reset in accordance with the weight supporting characteristics of the floor covering said selectively adjustable means including means to re-position said front wheels in accordance with the reset position thereof.

11. In a suction cleaner, a body having a suction nozzle, a supporting wheel adapted for adjustment vertically to raise or lower the nozzle relative to the surface to be cleaned, a feeler element pivoted to said cleaner normally held in a retracted position and releasable to float on the surface covering independent of the weight of said cleaner, and wheel positioning means including a selectively engageable clutch associated with said feeler element normally operable to hold said supporting wheel and nozzle in an adjusted position, said positioning means being operable to move said wheel a predetermined increment relative to said nozzle after said clutch re-engages as determined by the angular position of said released feeler relative to said body, and means to disengage said clutch and release said feeler momentarily.

12. In a suction cleaner, a body having a suction nozzle and supporting wheels, at least one of said wheels being adjustable vertically to raise or lower said nozzle with respect to the surface to be cleaned, means for adjusting said nozzle while the weight distribution to said supporting wheels is substantially the same as when the cleaner is at rest on the surface to be cleaned, said means comprising an adjustable connection between said adjustable wheel and said nozzle, a selectively engageable clutch mechanism including a feeler, said feeler being releasable to float on top of the surface being cleaned independent of the weight of said cleaner, and means to release said clutch and feeler and to re-engage said clutch to move said adjustable wheel a predetermined increment relative to said nozzle.

13. The combination with a suction cleaner having a body including a suction nozzle and supporting wheels, of semiautomatic means for selectively adjusting the plane of the nozzle opening to a proper operating height above a surface to be cleaned comprising resilient means connecting one of said wheels to said body so that said wheel is vertically adjustable with respect thereto, said resilient means being inadequate by itself to support the entire load on said one wheel, selectively adjustable means interposed between said one wheel and said body including spring means supplementing said resilient means and cooperable therewith to support the entire load normally carried by said one wheel, said adjustable means including a feeler element movably mounted on said cleaner and operable when released to float on the surface being cleaned independent of the cleaner weight, and manually operable means for increasing the stress on said spring means, releasing said feeler and disengaging said adjustable connection momentarily whereby upon release of said manually operable means power from said stressed spring causes said selectively engageable connection to re-engage in a position dependent upon the relative position between said body and said released feeler and to adjust said one supporting wheel with respect to said body.

14. The combination with a suction cleaner having a body including a suction nozzle and supporting wheels, of semiautomatic means for selectively adjusting the plane of the nozzle opening to a proper operating height above a surface to be cleaned comprising resilient means connecting one of said wheels to said body so that said wheel is vertically adjustable with respect thereto, a supplemental adjustable connection in-

cluding selectively engageable clutch means between said one wheel and said body operable to lock said wheel and body in a selected position in which said nozzle is adjusted to a particular position with respect to the surface being cleaned, said adjustable connection including a feeler operable when released to float on the surface being cleaned independent of the cleaner weight, means operable to disengage said clutch means and release said feeler, said feeler when released being operable to adjust said selectively engageable clutch means in accordance with the penetration of one of said supporting wheels in a surface covering as determined by said floating feeler and means to re-position said one wheel in accordance with the adjusted position of said selectively engageable clutch means.

15. In combination with a suction cleaner, a wheeled support therefor comprising at least one rear wheel and one front wheel, means to support one of said wheels adjustably with respect to said cleaner, said adjustable support including a clutch mechanism normally maintaining a predetermined adjustment between said cleaner and said one wheel, manually operable means to disengage said clutch mechanism and to re-engage it in a position dependent upon the cleaner supporting characteristics of the floor covering on which the cleaner is resting, said manually operable means including a feeler pivoted to said cleaner and arranged to be released upon disengagement of said clutch for free pivotal contact with the surface of said floor covering independent of the cleaner weight, and means interconnecting said clutch and said feeler and operative to modify the adjustment of said one wheel with respect to said cleaner dependent upon the angular position of said feeler when in contact with the surface of a floor covering.

16. The combination with a suction cleaner having a body including a suction nozzle and supporting wheels, of semiautomatic means for selectively adjusting the plane of the nozzle opening to a proper operating height above a surface to be cleaned comprising spring means connecting one of said wheels to said body so that said wheel is vertically adjustable with respect thereto, said spring means being more than adequate to support the entire load on said one wheel, selectively adjustable means interposed between said one wheel and said body to lock said one wheel and said body in a predetermined position in opposition to said spring means, said adjustable means including a feeler element movably

mounted on said cleaner and operable when released to float on the surface being cleaned independent of the cleaner weight, and manually operable means for increasing the stress on said spring means, releasing said feeler and disengaging said adjustable connection momentarily whereby upon release of said manually operable means, power from said stressed spring causes said selectively adjustable connection to re-engage in a position dependent upon the relative position between said body and said released feeler and to adjust said one supporting wheel with respect to said body.

17. The combination with a suction cleaner having a body including a suction nozzle and supporting wheels, of means for selectively adjusting the plane of the nozzle opening to a proper operating height above a surface to be cleaned comprising vertically movable mounting means for one of said wheels spring biased away from said cleaner body, selectively adjustable means interconnecting said mounting means and said body operable to limit the movement of the mounting means away from said body under the influence of said spring, said selectively adjustable means including a clutch operable to disengage when said wheels are moved toward said body to compress said spring, and a feeler arranged to float on the top of the surface covering independent of the cleaner weight when said clutch is disengaged and operable to control the point at which said clutch re-engages under the influence of said compressed spring and in accordance with the penetration of one of said wheels below the top of said surface covering as determined by said feeler.

18. The combination defined in the preceding claim including a cleaner propelling handle, and means for disengaging said clutch in response to a downward force on said handle.

HARRY B. WHITE.

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