Sept. 12, 1939. J. B. KIRBY 2,172,911

SUCTION SWEEPER

Filed May 3, 1937 2 Sheets-Sheet 1

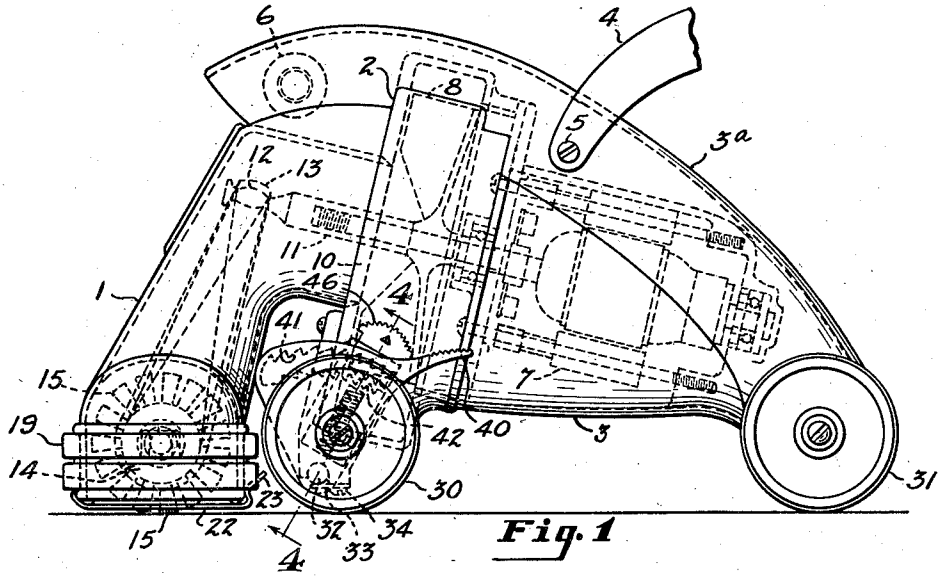

Fig. 1

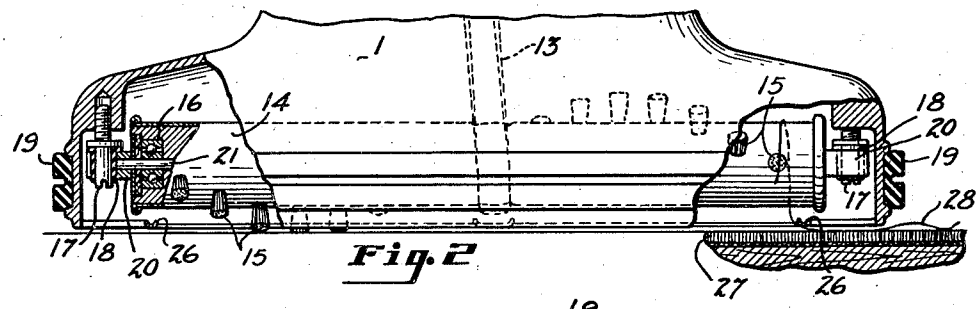

Fig. 2

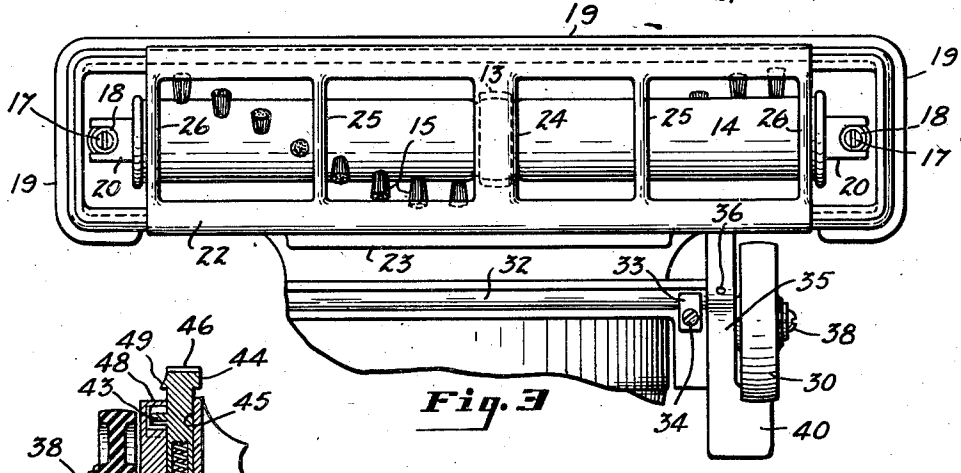

Fig. 3

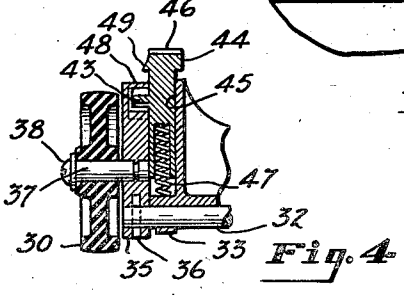

Fig. 4

INVENTOR
James B. Kirby
BY Edmund J. Te Pas
his ATTORNEY

Sept. 12, 1939. J. B. KIRBY 2,172,911

SUCTION SWEEPER

Filed May 3, 1937 2 Sheets-Sheet 2

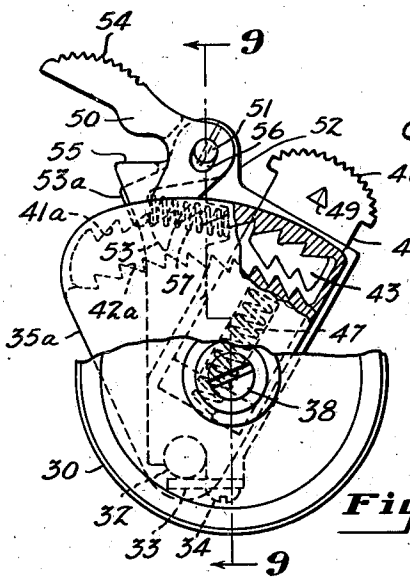

Fig. 5

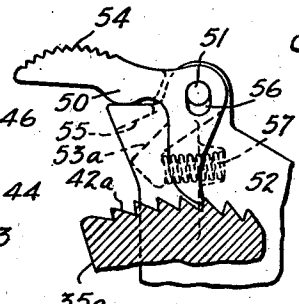

Fig. 6

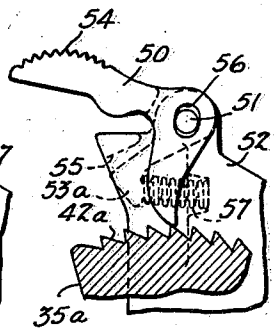

Fig. 7

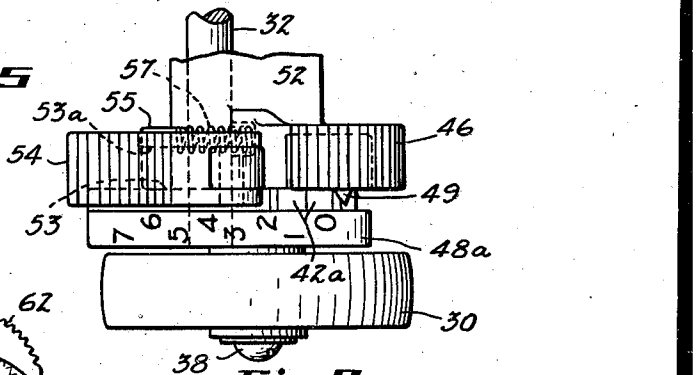

Fig. 8

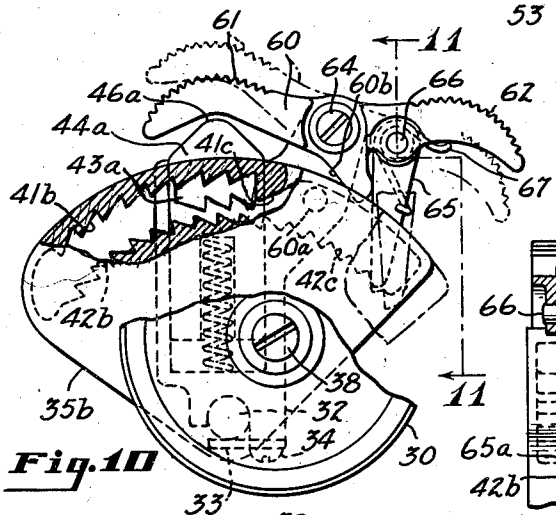

Fig. 10

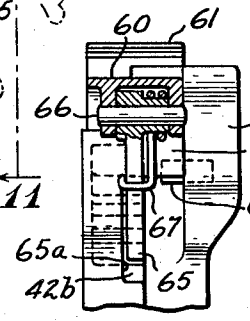

Fig. 11

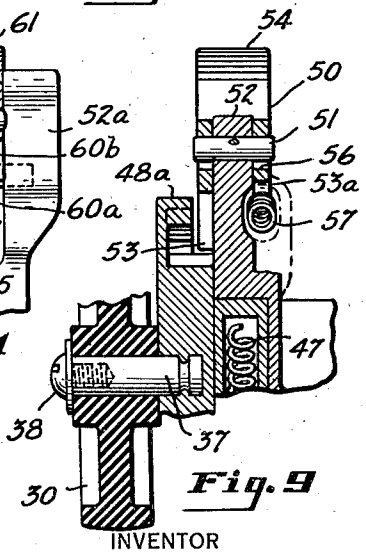

Fig. 9

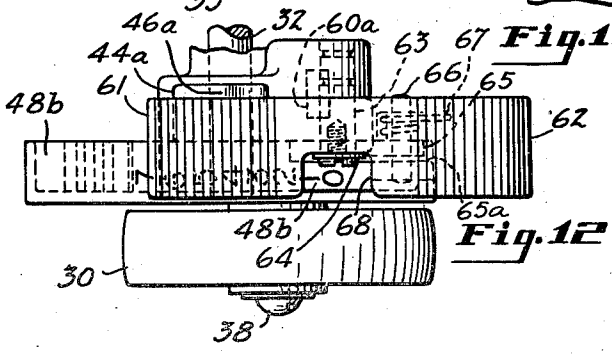

Fig. 12

INVENTOR
James B. Kirby
BY
Edmund J. Le Bas
his ATTORNEY

Patented Sept. 12, 1939 2,172,911

UNITED STATES PATENT OFFICE

2,172,911

SUCTION SWEEPER

James B. Kirby, West Richfield, Ohio

Application May 3, 1937, Serial No. 140,309

14 Claims. (Cl. 280—44)

This invention relates to suction cleaners or suction sweepers and it constitutes a continuation-in-part of my copending application Serial No. 20,377, which was filed May 8, 1935 for Vacuum cleaner. The present application also relates to improvements in a foot-operated, adjustable vacuum cleaner supporting structure of the type illustrated in my copending application Serial No. 677,602, which was filed on June 26, 1933 for Suction sweeper and which matured on May 4, 1937 into Patent No. 2,079,293.

One of the objects of this invention is the provision of an improved foot-operated mechanism for adjusting the working height of the suction nozzle of a vacuum cleaner, in which the mechanism is arranged so that both the raising and lowering of the cleaner nozzle must be effected in a step-by-step manner.

Another object of this invention relates to the provision of an improved means for preventing hairs and threads from wrapping around the bearing of the brush of a suction sweeper.

A further object of the invention relates to the provision of a vacuum cleaner of relatively simple and inexpensive construction which is adapted for carrying out the aforesaid objects.

These and other objects of the invention will become more apparent and better understood after consideration has been given to the following detailed description of the drawings which show, merely by way of illustration, structure adapted for carrying out the objects of the invention.

In the drawings, Figure 1 is a side elevational view of a suction sweeper, illustrating one mode of practicing the invention; Figure 2 is a detail side elevational view of the nozzle of the cleaner shown in Figure 1, with certain of the parts broken away to illustrate the details of the brush mounting; Figure 3 is a detail plan view of the underside of the nozzle shown in Figure 2; Figure 4 is a detail sectional view taken on line 4—4, Figure 1; Figure 5 is an enlarged side elevational view of a modified form of foot-actuated mechanism which may be used in place of the mechanism shown in Figure 1 for adjusting the working height of the nozzle of the cleaner; Figures 6 and 7 are fragmentary views of the mechanism shown in Figure 5, showing different working positions of the operating parts of such mechanism; Figure 8 is a detail plan view of the mechanism illustrated in Figure 5; Figure 9 is a sectional view taken on line 9—9, Figure 5; Figure 10 is a detail side elevational view of a modification of the structure shown in Figure 5; Figure 11 is a sectional view taken on line 11—11, Figure 10; and Figure 12 is a detail plan view of the form of foot-actuated mechanism shown in Figure 10.

The suction sweeper illustrated in the first sheet of the drawings comprises a casing structure including a suction nozzle 1, a fan case 2, a motor housing 3 and a top or finishing plate or cover member 3a to which the bail 4 of an operating handle (not shown) is pivotally attached at 5. The cover member 3a overlies the fan case, the motor housing and a portion of the nozzle. The cover member 3a may be arranged to provide a space above the nozzle 1 for the accommodation of a work illuminating lamp 6 by extending the top part of this member forwardly beyond the fan case in spaced relation with respect to the nozzle of the cleaner and thus define a housing for the lamp having an opening facing forwardly of the cleaner.

A motor 7 is located inside the motor housing 3. This motor is operatively connected to a fan 8 located inside the fan case 2. The fan case communicates with the nozzle of the cleaner by way of an aperture 10 through which an extended portion 11 of the motor armature shaft projects. The end of the shaft 11 is provided with a pulley 12 for driving a belt 13 operatively connected to a brush 14 located in the suction mouth of the cleaner which is defined by the lowermost portion of the nozzle 1.

A soft rubber bumper strip 19 is carried by the nozzle around and above the suction mouth of the cleaner. The brush 14 is provided with a series of bristles 15 which extend from one end to the other of the body of the brush. A short space is left at each end of the brush which is free of bristles for a purpose which will be explained later. Anti-friction bearings 16 are provided at the ends of the brush.

The brush is detachably mounted in the mouth of the cleaner by means of a pair of adjustable posts 17 having a soft rubber sleeve or bushing 18 which is frictionally engaged by the bifurcated or forked supporting members 20 of the brush. The members 20 are carried by a rod 21 which extends throughout the length of the brush.

A brush guard 22 is detachably secured over the suction mouth of the sweeper. This member is preferably made in the form of a light weight metal stamping and is arranged so that it may be sprung over the marginal portions of the nozzle and it has an offset portion 23 to facilitate its removal from the nozzle. The brush

guard is provided with a relatively wide central cross-piece 24 which serves to guard the belt from coming in contact with the surface being cleaned and prevents articles, such as, hair pins and the like from getting between the belt and the brush.

A pair of intermediate cross bars 25 and a pair of end cross bars 26 cooperate with the cross bar 24 in preventing carpets and rugs from being sucked up into the nozzle of the cleaner. The end cross bars 26 of the brush guard have the additional function of preventing threads, strings, hairs and the like from becoming wrapped around the bearing or supporting member of the brush during the operation of the sweeper by guiding and causing the same to be wrapped around the body of the brush rather than around the spindles by means of which the brush is supported and from which such articles are very difficult to remove. When such articles are collected on the brush supports, they have the tendency to lock the brush and prevent it from rotating.

The manner in which this feature of applicant's invention operates is illustrated in Figure 2 of the drawings in which a carpet or rug is indicated by the numeral 27 and the brush is shown in the act of wrapping a piece of thread, string or hair 28 about the end portion of the body of the brush.

The provision of a guard member, such as, 26 across the suction mouth of the cleaner between the last tuft of bristles and the end of the brush will function to prevent articles from being wrapped around the brush spindles or supports because suction alone is not capable of removing such articles from the carpet and drawing them into the nozzle of the sweeper. It is necessary, therefore, that the bristles of the brush first contact with the thread or the like before it can be dislodged from the carpet and by positioning a guard member as shown in the drawings, the threads, strings, hair and the like are kept away from the brush bearings in the manner illustrated in Figure 2 and are caused to collect on the body of the brush where they do not interfere with its operation.

The cleaner is supported by means of a pair of forwardly located wheels 30 and a pair of rearwardly located wheels 31. The forwardly located wheels are operatively associated with a shaft 32 rotatably secured to the underside of the cleaner casing by means of clips 33 which are secured in place by any suitable means, such as, screws 34.

Crank arms are fixedly secured to the opposite ends of the shaft 32 and bearing pins are carried by such crank arms for mounting the wheels 30 for rotation about an axis to one side of the axis of the shaft 32. The crank arm and pin at one side of the cleaner are of peculiar construction and form part of an operating mechanism by means of which the shaft 32 may be rotated in one direction or another in a step-by-step manner by means of a pair of foot-operated members.

The details of such mechanism are illustrated best in Figures 1 and 4. In these views, the crank arm is indicated by the numeral 35 and this arm is secured to the shaft 32 in any suitable manner such as by means of a pin 36. A bearing pin 37 for the wheel 30 is carried by the crank arm 35 and the wheel 30 is held in place thereon by any suitable means such as the screw 38. The crank arm illustrated in Figures 1 and 4 is of segmental outline and its rearward portion is extended to provide a foot pad 40.

A channel or groove is formed in the upper portion of the segmental crank arm 35 and in this channel, upper and lower rows of ratchet teeth 41 and 42 respectively are provided. These ratchet teeth cooperate with a toothed element 43 which may be formed on the side of a member 44. This member is guided for movement in a suitable channel 45 formed in a portion of the cleaner casing structure.

A foot pad 46 is arranged on top of the member 44 and a spring 47 is provided to urge the member 46 to its uppermost position so that the toothed member 43 engages with the upper row 41 of the ratchet teeth. The ratchet teeth and the teeth of the toothed member 43 face in a direction so that they will not oppose movement of the segmental crank member when moved in a direction occasioned by a downward pressure on the foot pad 40 of this member and in this manner, the working mouth of the sweepr may be elevated with respect to the surface being operated upon. Suitable marks are formed on the top face 48 of the segmental crank 35 for cooperation with the pointer 49 of the member 44 to indicate the elevation of the cleaner.

When it is desired to lower the nozzle of the sweeper, a downward pressure on the pad 46 will permit the cleaner to move downwardly under the force of gravity a distance corresponding to one notch of the ratchet teeth. The toothed element 43 and the cooperating rows of ratchet teeth 41 and 42 constitute an escapement device, and in lowering the cleaner, it is necessary to do so in a step-by-step manner. The elevating of the cleaner nozzle may be effected in steps which may correspond to one or more teeth of the ratchet, for it is evident that with the construction shown, the pad 40 may be depressed in a single movement for one or more notches of the ratchet teeth or for the full extent of its travel.

The foot adjustment illustrated in Figures 1 to 4 is open to the objection in that an inexperienced person might have difficulty in raising the sweeper nozzle the exact amount desired and the modified construction shown in the second sheet of the drawings are provided to absolutely insure that downward pressure upon either one of the foot-operated pads will cause the raising or lowering of the suction nozzle a predetermined amount for each time that the pads are operated, regardless of the pressure exerted or the manner in which the pads are operated.

In the modified mechanism shown in Figures 5 to 9, like reference numerals indicate like parts which have been previously described and which operate in the same manner in this form of mechanism as they do in the mechanism just described.

In the modified construction, a segmental crank member 35a is used which differs from the member previously described in that it does not have a foot pad rigidly attached to it, as in the case of the segmental member 35. In place of the foot pad 40 for elevating the cleaner, a pedal 50 is pivotally mounted on a pin 51 carried by a fixed part 52 of the sweeper casing structure. The pedal 50 is in the form of a bell crank and the arm 53 of this crank constitutes a latch or pawl which is adapted to engage with the lower row 42a of the ratchet teeth. The other arm of the pedal or bell crank constitutes a foot pad 54.

The part 52 of the casing structure is formed with a portion 55 which provides a stop for the

crank member 50 in either one of its limiting positions, as illustrated in Figures 5 and 6. The pedal member 50 is provided with openings 56 of such shape and size as to permit limited bodily movement of the pedal with respect to the pin 51 in order to permit the pawl 53 from moving into and out of engagement with the ratchet teeth 42, as is clearly illustrated in Figures 6 and 7.

A spring 57 is provided for urging the arm 53a of the foot pedal 50 to its uppermost position illustrated in Figure 5 of the drawings. It is apparent that when pressure is exerted upon the pad 54, the cleaner nozzle will be raised a predetermined distance, depending upon the spacing of the ratchet teeth 42a and the same may be successively elevated in a step-by-step manner by means of the mechanism shown. The means for lowering the suction nozzle of the cleaner are exactly the same as the means previously described and the toothed element 43 of the foot-operated member 44 cooperates with the ratchet teeth 41a and 42a in lowering the cleaner in a step-by-step manner.

The top face 48a of the segmental crank member 35a is provided with numerals or other suitable indicia to indicate the elevation of the sweeper nozzle with respect to the surface being operated upon and in the case of the modification shown in Figures 1 to 4, the foot-operated member 44 is provided with a pointer 49 which cooperates with the marked portion of the crank member.

In the modification of the invention illustrated in Figures 10 to 12, a slightly modified form of segmental crank member 35b is used. In this member, the upper ratchet teeth 41b do not extend throughout the full length of the arc of the segment, as do the teeth 42b and 42c of the lower row of teeth. In this modification of the invention, the previously described, separately operated pads 46 and 54 are combined in a single element or a double pedal member 60 having a pad 61 at its forward end and another pad 62 at its rearward end and the same is pivotally mounted upon a pin 63 located intermediate its length. A screw 64 holds the pedal in place on its pin 63.

A member 44a similar to the member 44 previously described is located beneath the forward end of the pedal pad 61 and in place of a corrugated surface 46 the present member is provided with a rounded top portion 46a which is adapted for engagement with the underside of the pad 61.

The member 44a is in all other respects substantially the same as the member 44 previously described and it has a toothed element 43a which cooperates with the toothed portions 41b and 42b of the ratchet for lowering the cleaner. A stop 41c cooperates with the element 43 for limiting the movement of the segment 35b in one direction.

A pawl 65 is pivotally secured adjacent to the rear portion of the pedal member 60 by means of a pin 66 and a spring 67 is provided to urge the end of this pawl into engagement with a set of ratchet teeth 42c so that each time the pad 62 is depressed, the nozzle of the sweeper will be raised a predetermined amount. This mechanism functions in substantially the same manner as the form of the invention illustrated in Figures 5 to 9 insofar as the raising of the cleaner is concerned. The pedal member is provided with an arm 60b and the casing structure part 52a is provided with a pin 60a which cooperates with the arm 60b to provide a stop for limiting the downward movement of the pad 62 of the pedal member.

The lowering of the cleaner nozzle is effected in a step-by-step manner by simply pressing on the pad 61 and this movement is in turn transmitted to the member 44a and this part of the mechanism operates in exactly the same manner as the arrangements previously described. The side of the segmental member 35b is cut away a slight amount at 65a for the accommodation of the pawl 65. The pedal member 60 is notched out at 68 to define a window or aperture by means of which the indicating numerals on the top face 48b of the segment may be observed.

The motor and fan case of the cleaner are preferably arranged as elements separate from the cover member 3a which partially covers such elements, and by reason of this arrangement, it is possible to streamline the shape of the casing structure because its form is not determined by the precise outline of the fan case and motor. The axis of the motor and fan case is inclined as shown to permit the use of a more pleasing design of casing without at the same time increasing the size of the casing beyond the size necessary to accommodate the necessary working elements of the device.

In the form of the invention illustrated in Figures 1 to 4, the foot pedal 40 cooperates with the crank arm 35 to form a fulcrum lever of the first class, in which the axis of the front supporting wheels 30 constitutes the fulcrum of such lever. The foot pedal 40 is located rearwardly of the wheel axis so that downward pressure on the foot pedal will elevate the cleaner nozzle. In the form of the invention illustrated in Figures 5 to 8, the arm 53 and the foot pad 54 together form a fulcrum lever of the first class, the fulcrum of which coincides with the axis of the bearing pin 51. In the form of the invention illustrated in Figures 10 to 12, the pad 62 and the pawl 65 cooperate to provide a fulcrum lever of the second class in which the fulcrum of the lever coincides with the axis of the bearing pin 63.

The foregoing description and the accompanying drawings to which it relates, describe what might be termed the preferred modes of practicing the invention. It is to be understood, however, that the invention includes each and every novel feature or combination of novel features herein disclosed, and that subject only to the restrictions of the prior art, the invention may assume other forms and it is not to be limited to the particular and specific structure shown and described herein.

Having thus described my invention what I claim is:

1. In a portable device of the class described, a casing structure, supporting wheels for said casing structure, means carried by said casing structure for supporting said wheels for rotational and bodily movement with respect to the casing structure, and means for adjusting the elevation of the casing structure with respect to the working surface, said last-named means comprising an operating member pivotally attached to said casing structure having an arcuate slot with ratchet teeth formed at the opposite sides of the slot, and a spring-pressed plunger mounted for rectilinear movement on said casing structure having an element cooperating with the ratchet teeth of said member for lowering said casing structure in a step-by-step manner.

2. In a portable device of the class described,

supporting wheels for the device, eccentric mounting means for rotatably supporting said wheels whereby the device may be raised or lowered, and mechanism for effecting the adjustment of said supporting wheels including a pair of foot-operated elements associated with said eccentric mounting means, one for raising and the other for lowering the device to its various adjusted operating positions, said mechanism being constructed and arranged so that the aforesaid movements of the device can only be effected in steps of a predetermined distance.

3. In a portable device of the class described, supporting wheels for the device, means for rotatably and movably supporting said wheels, ratchet means for adjusting the position of said wheels with respect to the device whereby the device may be raised or lowered, said ratchet means comprising a pair of foot-operated elements associated with said ratchet means, one for raising and the other for lowering the device to various operating positions in a step-by-step manner, said ratchet means being constructed and arranged so that the aforesaid movements of the device can only be effected in steps of a predetermined distance.

4. In a portable device of the class described, supporting wheels for the device, means for adjustably and rotatably supporting said wheels, whereby the device may be raised or lowered with respect to the working surface, and mechanism for effecting the adjustment of said supporting wheels including a pair of foot operated members, one for raising and the other for lowering the device in a step-by-step manner to its various adjusted operating positions, said mechanism being constructed and arranged so that the aforesaid movements of the device can only be effected in steps of a predetermined distance.

5. In a portable device of the class described, supporting wheels for the device, and means for mounting said wheels for rotatable and bodily movements with respect to said device, said means including a rack and a pair of downwardly movable foot-operated members associated therewith for effecting bodily adjustment of the position of said wheels, one of said foot-operated members being adapted to move said rack in one direction and the other of said foot-operated members being mounted for rectilinear movement and cooperating with said rack to provide a stop for movement of the rack in an opposite direction.

6. In a portable device of the class described, supporting wheels for the device, and means for mounting said wheels for rotatable and bodily movements with respect to said device, said means including a rack and a pair of downwardly movable foot-operated members associated therewith for effecting bodily adjustment of the position of said wheels, one of said foot-operated members being adapted to move said rack in one direction and the other of said foot-operated members being mounted for rectilinear movement and cooperating with said rack to provide a releasable stop therefor for controlling bodily movement of said wheels in an opposite direction.

7. In a portable device of the class described, supporting wheels for the device, and means for adjustably and rotatably supporting said wheels, whereby the device may be raised or lowered with respect to the working surface, said means including a pivotally mounted lever having a pair of foot-operated pads, one for raising and the other for lowering the device in a step-by-step manner to its various adjusted operating positions when downward pressure is applied to the respective pads.

8. In a portable device of the class described, a supporting wheel at each side of the device, both located forwardly of the center of gravity and rearwardly of the front end of the device, mechanism for mounting said wheels on the device for simultaneous and bodily adjustable movement relative thereto, and means for effecting the operation of said mechanism, said means including a pivotally mounted lever having a pair of foot-operated pads, one for positively raising and the other for permitting gravity lowering of the front end of the device in a step-by-step manner to its various adjusted operating positions when downward pressure is applied to the respective pads.

9. In an article of the class described, a device to be supported, and an adjustable supporting structure therefor comprising a ratchet member with two sets of contiguous, similarly formed ratchet teeth, means for mounting said ratchet member so that the weight of said device tends to move it in one direction and foot-operated means including an element associated with only one of said sets of ratchet teeth for moving the ratchet member in one direction and a second element associated with both of said sets of ratchet teeth for controlling the movement of said ratchet device in an opposite direction.

10. In an article of the class described, a device to be supported, and an adjustable supporting structure therefor comprising a ratchet member with two sets of contiguous, similarly formed ratchet teeth, means for mounting said ratchet member so that the weight of said device tends to move it in one direction and foot-operated means including an element associated with only one of said sets of ratchet teeth for moving the ratchet member in one direction and a second element associated with both of said sets of ratchet teeth for preventing the movement of said ratchet device in an opposite direction except when said second element is operated.

11. In an article of the class described, a device to be supported, and an adjustable supporting structure therefor comprising a ratchet member with two sets of contiguous, similarly formed ratchet teeth, means for mounting said ratchet member so that the weight of said device tends to move it in one direction, foot-operated means including an element associated with only one of said sets of ratchet teeth for moving the ratchet member in one direction and a second element associated with both of said sets of ratchet teeth for controlling the movement of said ratchet device in an opposite direction and means associated with said ratchet member for indicating the adjustment of said supported device.

12. In a device of the type described, a structure to be supported, and an adjustable supporting mechanism therefor comprising fore and aft supporting wheels including a pair of wheels located forwardly of the center of gravity of the device, crank means for rotatably supporting said pair of wheels for movement about a substantially horizontal axis, means for pivotally connecting said crank means to said supported structure for movement about an axis parallel to and forwardly of said wheel axis, and a foot pedal operably connected to said crank means rearwardly of the axis of said pair of wheels and forming with said crank means a fulcrum lever

of the first class for raising the device when downward pressure is applied to the foot pedal, the position of the fulcrum of such lever coinciding substantially with the axis of said pair of wheels, and means for maintaining said foot pedal in its various adjusted positions.

13. In a device of the type described, a structure to be supported, and an adjustable supporting mechanism therefor comprising fore and aft supporting wheels including a pair of wheels located forwardly of the center of gravity of the device, crank means for rotatably supporting said pair of wheels for movement about a substantially horizontal axis, means for pivotally connecting said crank means to said supported structure for movement about an axis parallel to and forwardly of said wheel axis, and a foot pedal operably connected to said crank means rearwardly of the axis of said pair of wheels and forming with said crank means a fulcrum lever of the first class for raising the device when downward pressure is applied to the foot pedal, the axis of said pair of wheels forming the fulcrum of such lever, and means for maintaining said foot pedal in its various adjusted positions, said last-named means being slidably mounted for rectilinear movement and adapted for foot actuation to effect the lowering of the device.

14. In a device of the type described, a structure to be supported, and an adjustable supporting mechanism therefor comprising fore and aft supporting wheels including a pair of wheels located forwardly of the center of gravity of the device, crank means for rotatably supporting said pair of wheels for movement about a substantially horizontal axis, means for pivotally connecting said crank means to said supported structure for movement about an axis parallel to and forwardly of said wheel axis, and a foot pedal operably connected to said crank means rearwardly of the axis of said pair of wheels and forming with said crank means a fulcrum lever of the first class for raising the device when downward pressure is applied to the foot pedal, the axis of said pair of wheels forming the fulcrum of such lever, and plunger means for maintaining said foot pedal in its various adjusted positions, said plunger means being slidably mounted and adapted for foot actuation to effect the gravity lowering of the device in steps of a predetermined distance.

JAMES B. KIRBY.