

Nov. 2, 1971

W. F. LARSON
POWER DRIVEN ROAD SWEEPER WITH Laterally and Angularly
ADJUSTABLE BRUSH

3,616,477

Filed May 2, 1969

7 Sheets-Sheet 1

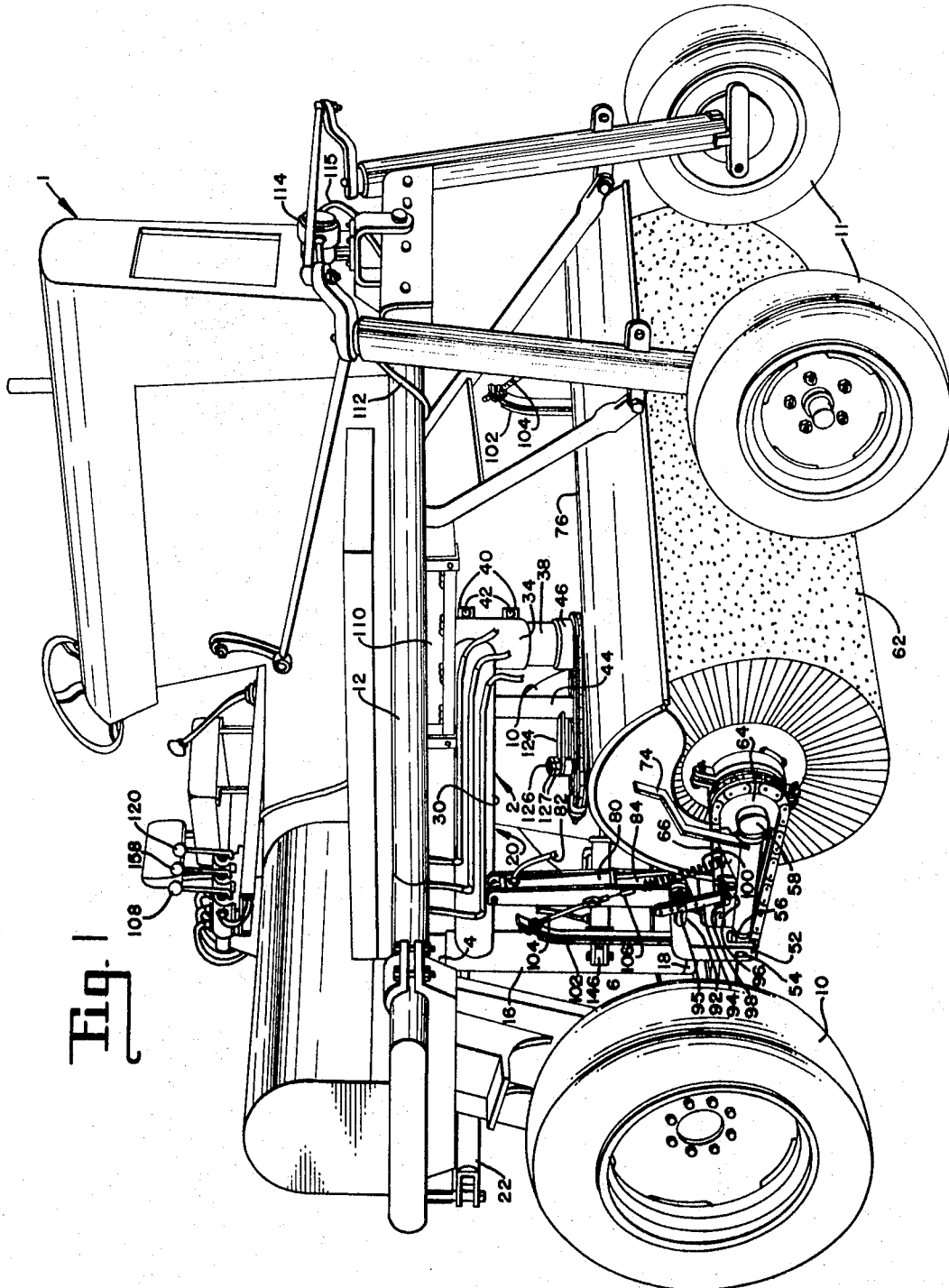


Fig. 1

WALTER F. LARSON
INVENTOR.

BY

Wayland D. Keith
HIS AGENT

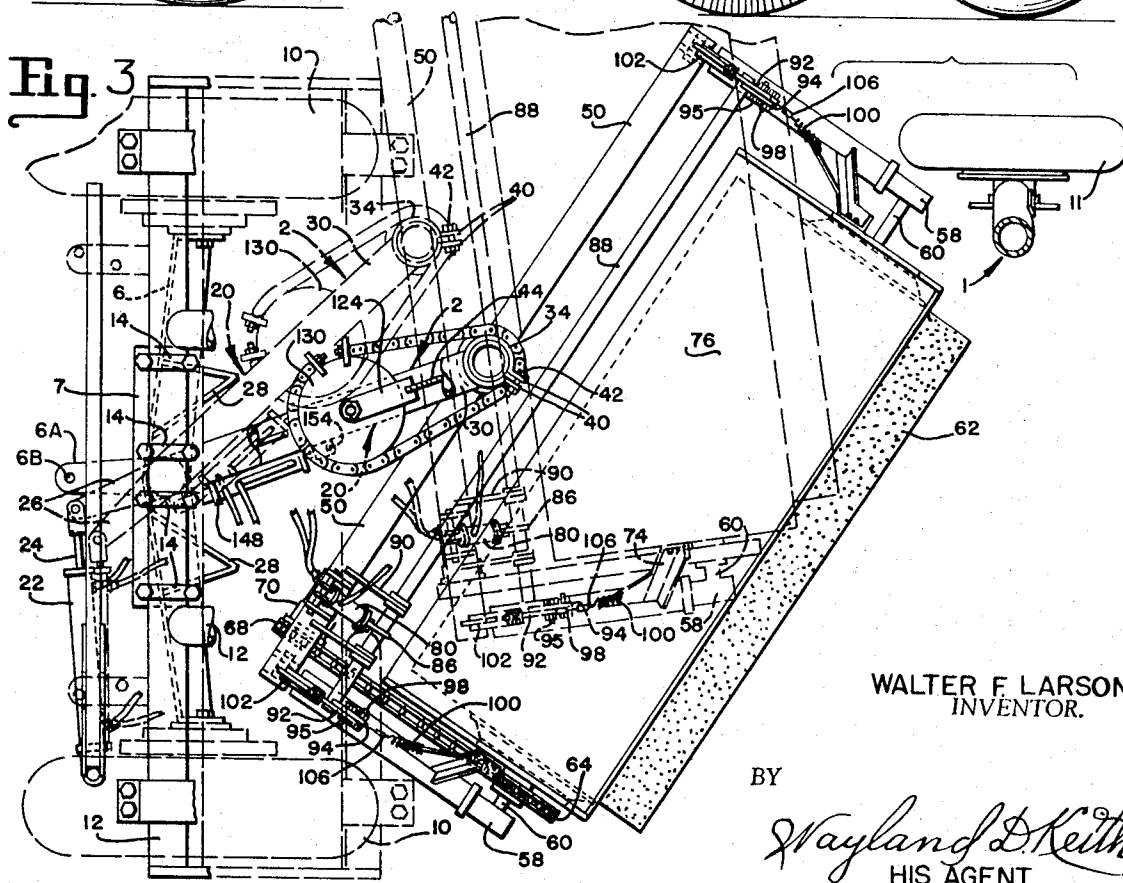
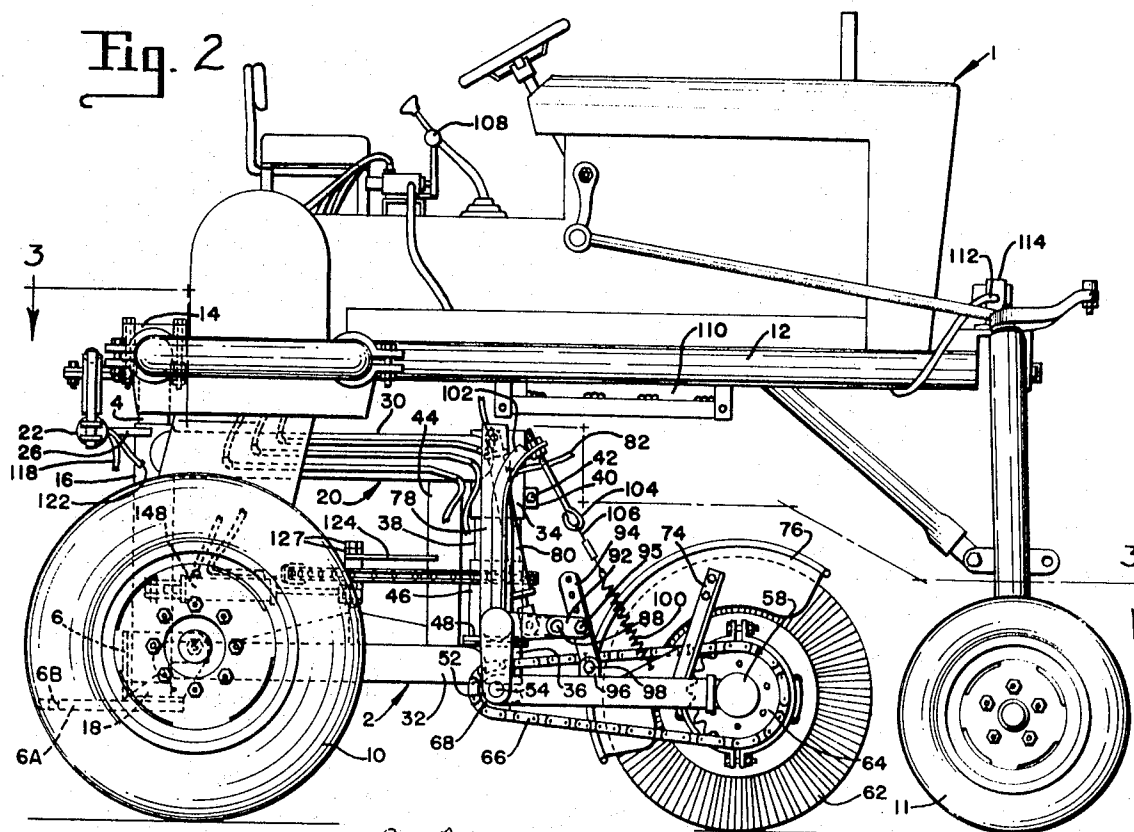
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7 Sheets-Sheet 2



WALTER F. LARSON
INVENTOR.

BY

Wayland D. Keith
HIS AGENT

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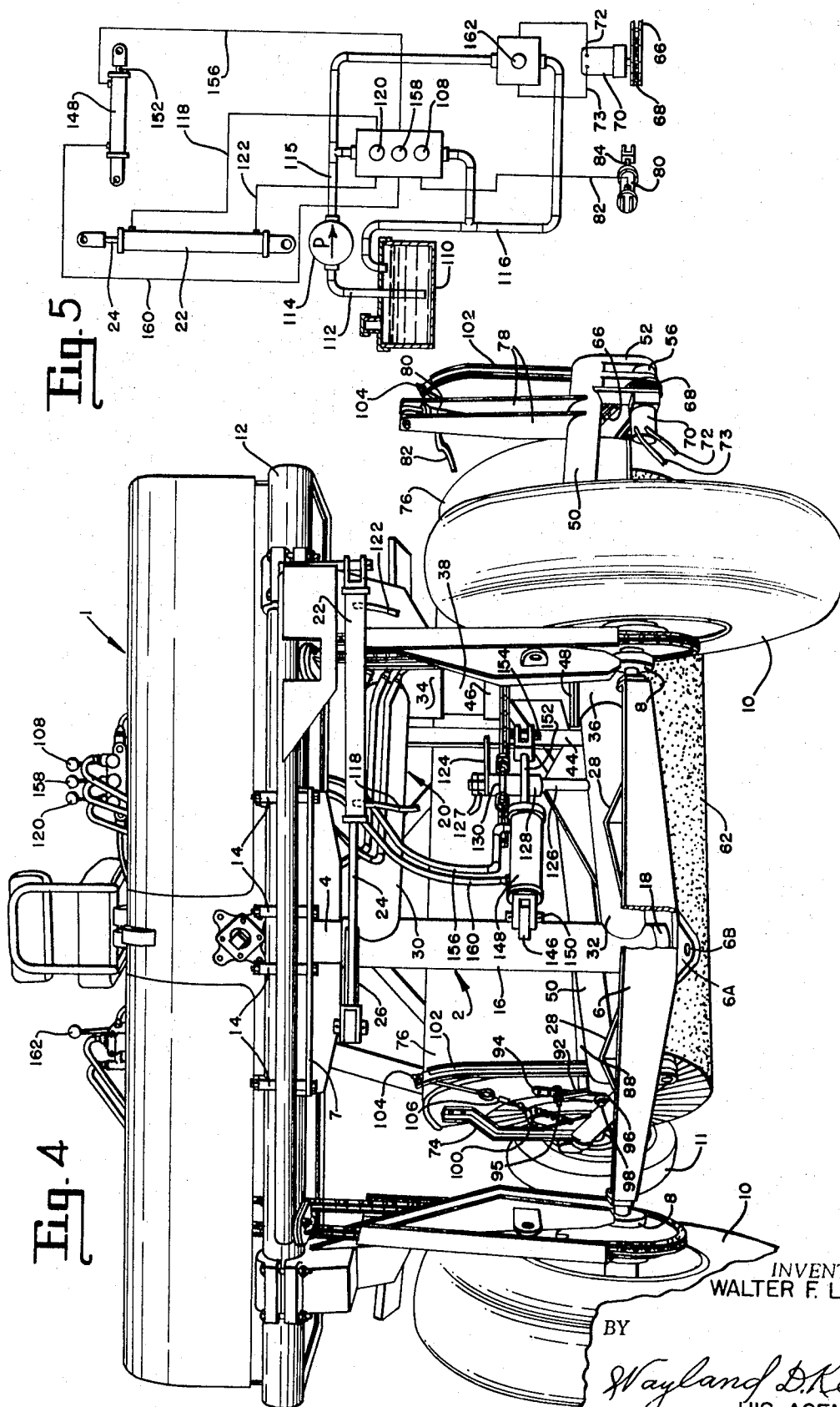


Fig. 5

Fig. 4

INVENTOR.
WALTER F. LARSON

BY

Wayland D. Keith
HIS AGENT

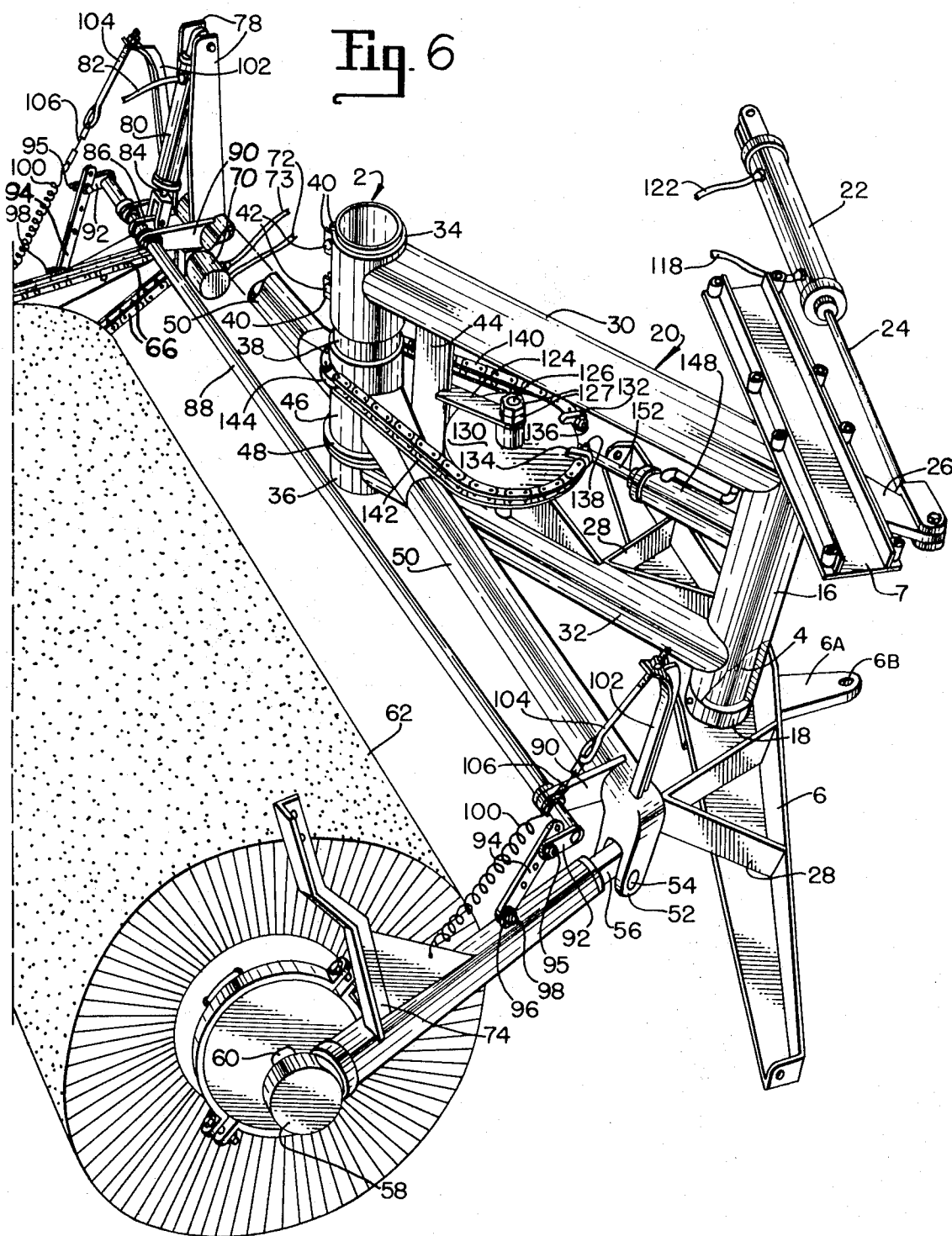
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WALTER F. LARSON
INVENTOR.

BY

Wayland D. Keith
HIS AGENT

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FIG. 7

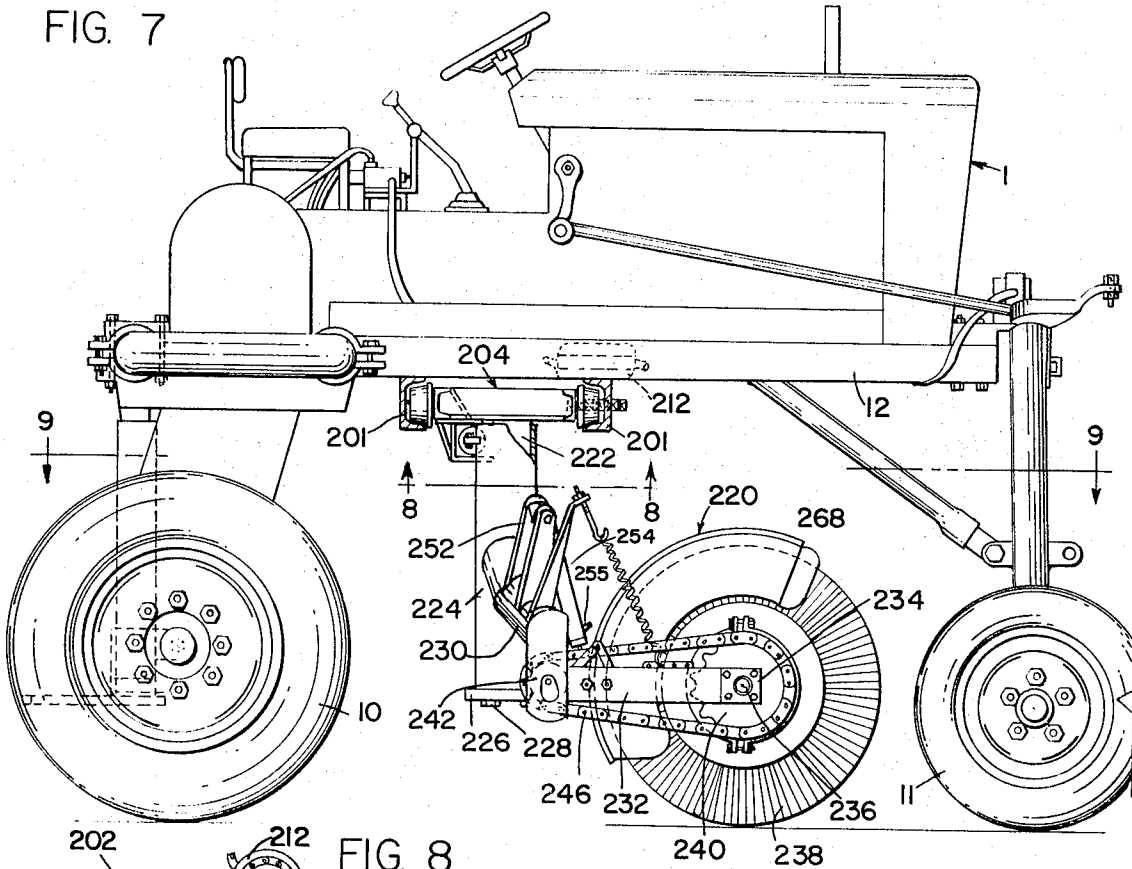
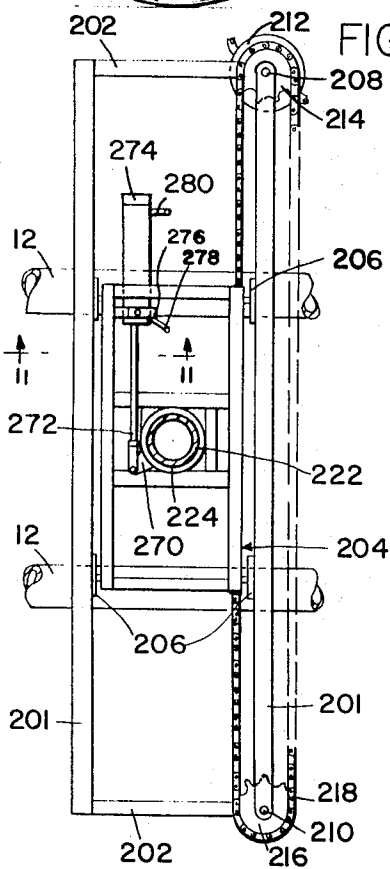


FIG. 8



WALTER F. LARSON
INVENTOR.

BY

Wayland D. Keith
HIS AGENT

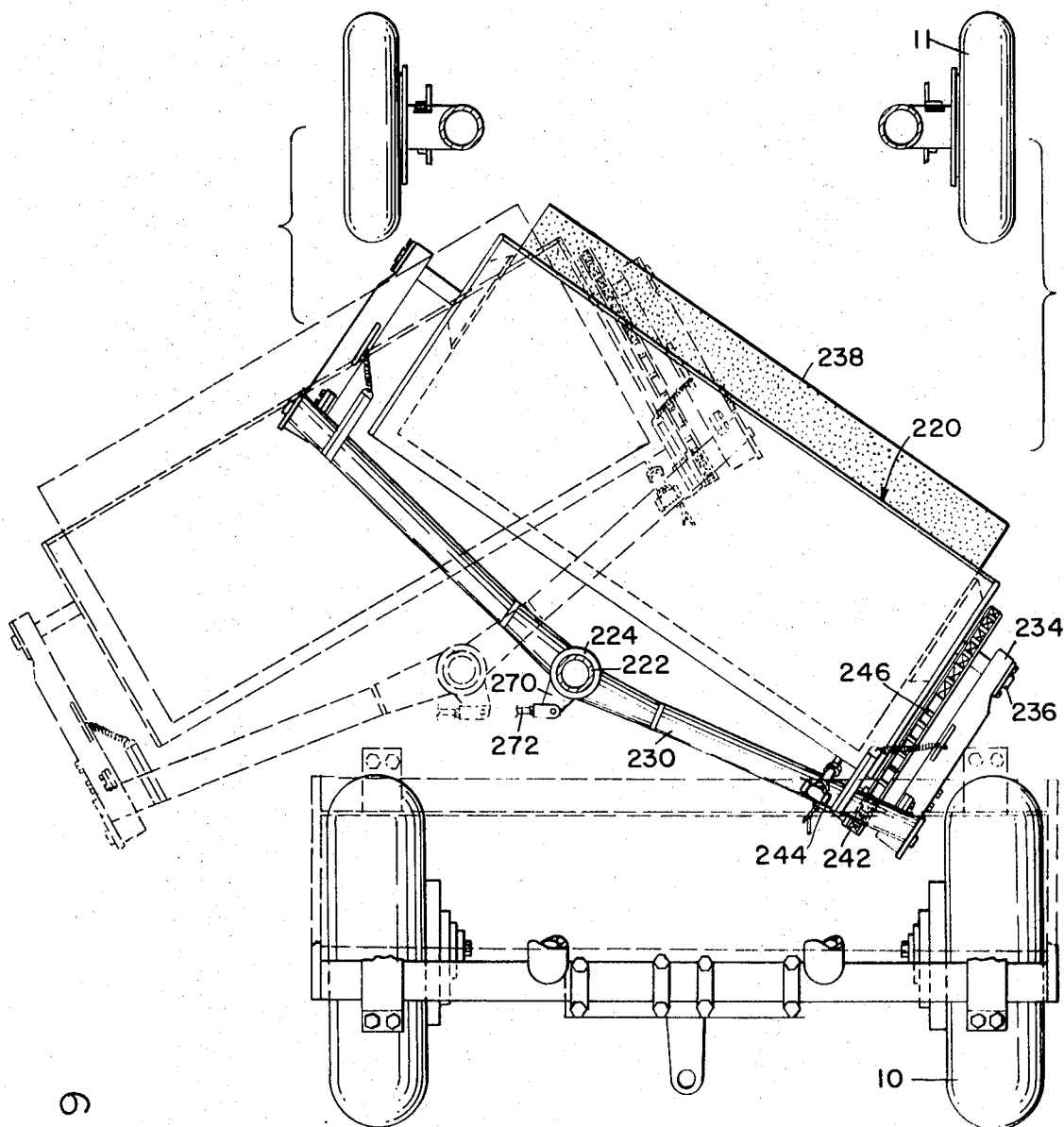
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7 Sheets-Sheet 6



WALTER F. LARSON
INVENTOR.

BY

BY *Wayland D. Keith*
HIS AGENT

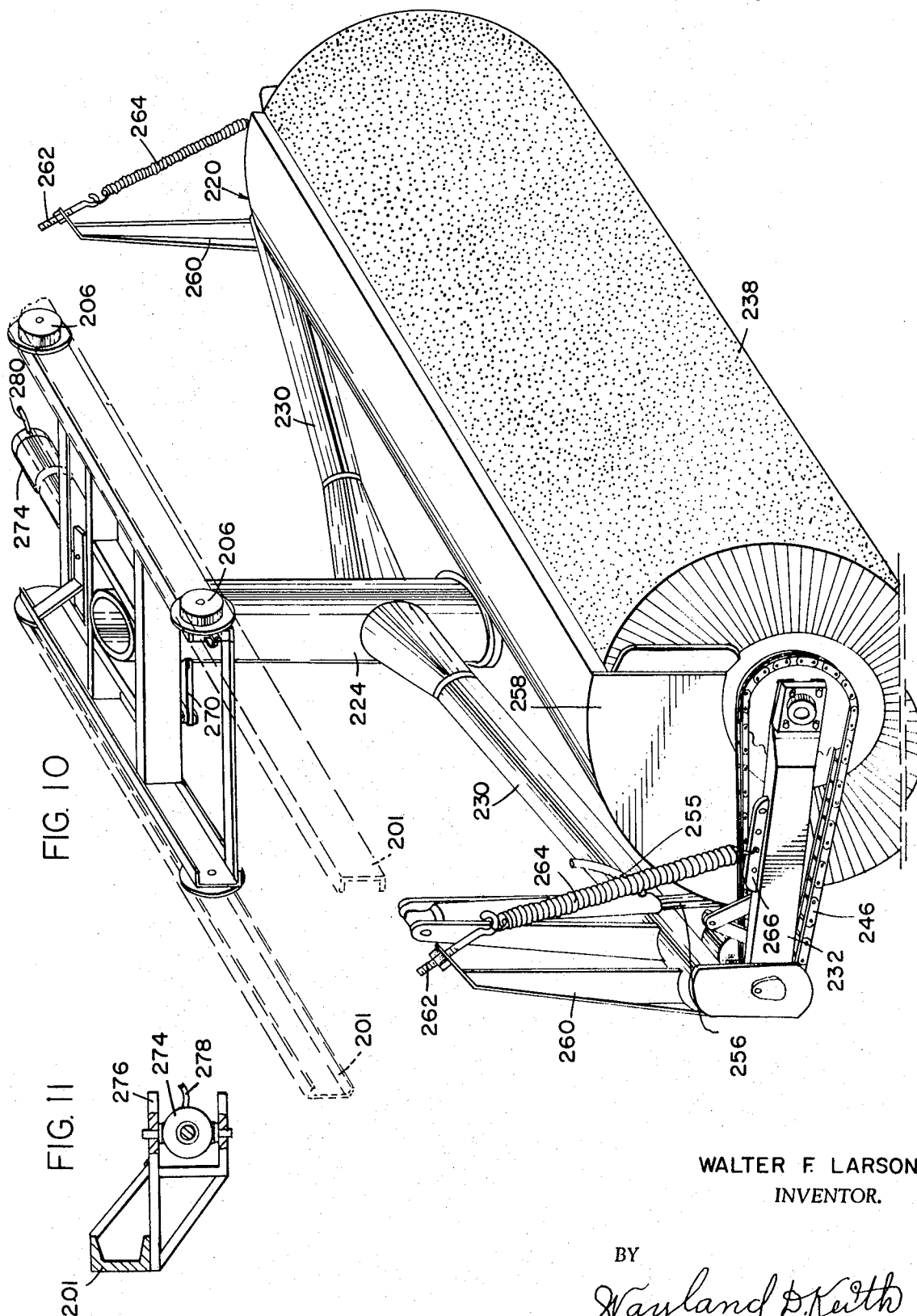
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7 Sheets-Sheet 7



WALTER F. LARSON
INVENTOR.

BY

Wayland D. Keith
HIS AGENT

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3,616,477

POWER DRIVEN ROAD SWEEPER WITH LATERALLY AND ANGULARLY ADJUSTABLE BRUSH
Walter F. Larson, % W. Larson, Inc., P.O. Box 1967,
Plainview, Tex. 79072

Continuation-in-part of application Ser. No. 638,831,
May 16, 1967. This application May 2, 1969, Ser.
No. 827,466

Int. Cl. E01h 1/05

U.S. Cl. 15—82

14 Claims

ABSTRACT OF THE DISCLOSURE

A power driven mobile sweeper, having a high frame and a relatively short wheel base, with a transversely movable support frame thereunder. A rotary brush mounting frame mounted on a vertical axis on the transversely movable support frame therebelow and below the mobile sweeper. The transversely movable support frame is movable transversely of the tractor by fluid actuated means, such as a fluid cylinder, and the brush mounting frame is movable arcuately, with respect to the transversely movable support frame, by fluid actuated means, such as a fluid cylinder. This enables the rotary brush mounting frame to be moved from side to side of the support frame and extend outwardly on either side of the mobile sweeper at different angles. The brush is driven by a prime mover, such as a fluid powered motor connected thereto in geared relation.

This application is a continuation-in-part of application Ser. No. 638,831, filed May 16, 1967, and now abandoned, for Power Driven Road Sweeper with Laterally and Angularly Adjustable Brush, and is co-pending therewith.

This invention relates to mobile power sweepers and more particularly to a tractor mounted power sweeper for sweeping roadways, streets and the like.

Various road and street sweepers have been proposed heretofore, the brushes or brooms of which were angulated either to one side or the other side of the path being swept; however, for the most part, the brushes were secured at a fixed angle. The brush would, in many instances, pivot about vertical axis and would sweep either to the right or to the left.

The present invention is so designed as to pivot, on an arcuately movable support frame, about a vertical axis to enable the support frame to be shifted about the vertical axis to the right or left. A brush mounting frame is pivoted about a vertical axis on the support frame to further pivot the brush thereabout. This gives great versatility in the sweeping of streets or roadways as the brush can be readily offset laterally to either side, to extend outwardly therefrom a substantial distance, usually as much as three feet and then the brush can be made to angle 30° or more to the left or 30° or more to the right, or it may be arranged with the axis thereof perpendicular to the line of travel of the tractor. In this manner any sweeping condition can readily be met.

The present machine is so constructed as to support the rotating brush therebelow and sweep in such manner that the dust therefrom is directed away from the driver of the vehicle.

An object of this invention is to provide a rotary brush for a road or street sweeper, whereby the brush is mounted on a horizontal axis that can be angulated either to the right or to the left with respect to the line of travel of the sweeper or the axis of the broom can be arranged perpendicular to the line of travel of the sweeper.

Another object of the invention is to provide a road or street sweeper, whereby the brush thereof may be moved laterally to either side of the machine, so as to extend outward from either side thereof, and while extending outward therefrom, it may be angulated about a vertical axis, either to the right or to the left with respect to the line of travel of the machine, or the axis of the brush can be perpendicular to the line of travel of the machine.

Still another object of the invention is to provide, on an elevated tractor frame, a street sweeper which positions the driver high above the dust being created thereby.

Still a further object of the invention is to provide a street or road sweeper of the rotary brush type, wherein, the frame, which pivotally mounts the brush for angulation about a vertical axis, is hydraulically controlled.

Yet another object of the invention is to provide a vertically pivoted, arcuately movable support frame which pivotally mounts a brush mounting frame for pivoting about a vertical axis so the arcuately movable support frame and the brush mounting frame may be movable independently about their respective axes, by hydraulic power.

Yet a further object of the invention is to provide hydraulic raising means for the rotary brush, and a spring support means therefor, to support at least a portion of the weight of said brush.

With these objects in mind and others which will become manifest as the description proceeds, reference is to be had to the accompanying drawings in which like reference characters designate like parts in the several views thereof, in which:

FIG. 1 is a perspective view of the tractor mounted, rotary brush type, road or street sweeper with certain hydraulic supply lines broken away to avoid crowding;

FIG. 2 is a side elevational view of the tractor mounted, rotary brush type, road or street sweeping machine, showing the horizontal axis of the brush arranged perpendicular to the line of travel of the sweeper;

FIG. 3 is a fragmentary sectional view taken on line 3—3 of FIG. 2, looking in the direction indicated by the arrows, showing, in full outline, the arcuately movable support frame shifted to one angle, showing the rotary brush mounting frame shifted at another angle with respect thereto; a further position of the support frame and the brush mounting frame is shown in dashed outline, with support frame shifted to another angle, and showing the rotary brush shifted at still another angle and extending outward beyond the wheels of the tractor, with a portion thereof being broken away;

FIG. 4 is a perspective view of the tractor taken from the rear, showing the rotary brush extending outward at an angle on one side of the tractor, and showing the arcuately movable, support frame shifted to the maximum angle to one side;

FIG. 5 is a diagrammatic view of the hydraulic system of the street or road sweeper;

FIG. 6 is an enlarged fragmentary, perspective view of the arcuately movable support frame, the brush mounting frame, the brush support arms, the rotary brush, and the brush drive mechanism which element comprise the sweeper mechanism, which sweeper mechanism is shown apart from the tractor, showing the assembly without the dust shield thereon to better bring out the details of construction;

FIG. 7 is a side elevational view similar to FIG. 2, but of a modified form of the invention using a transversely movable support frame mounted on parallel tracks;

FIG. 8 is a sectional view taken on line 8—8 of FIG. 7, looking in the direction indicated by the arrows;

FIG. 9 is a sectional view taken substantially along line 9—9 of FIG. 7, looking in the direction indicated by the arrows;

FIG. 10 is an enlarged, fragmentary, perspective view similar to FIG. 6, but of the modified form of the invention;

FIG. 11 is a fragmentary sectional view taken on line 11—11 of FIG. 8, looking in the direction indicated by the arrows.

With more detailed reference to the drawings, the numeral 1 designated generally a high clearance tractor, such as used on farms, around warehouses, docks and the like. The numeral 2, as is best seen in FIG. 6, designated generally, the composite sweeper unit and the mounting frame therefor. The numeral 4 designated an upright cylindrical standard which extends between a transverse support beam 6 and a transverse attachment member 7.

The transverse support beam 6 extends between the frames 8 mounting the rear wheels 10 of the tractor 1, as is best seen in FIG. 4. An apertured lug is secured to the rear side of draw bar 6, and forms a drawbar attachment for the tractor 1. The transverse attachment member 7 is secured to the tractor frame 12 by means of clamps 14, so as to rigidly support upright standard 4 in a substantially vertical plane, to enable a sleeve 16 to be journaled on the upright cylindrical standard 4 for rotation about the axis thereof. A thrust bearing 18 is positioned on the upright cylindrical standard 4 below the end of the sleeve to form a bearing member for the sleeve 16. The upper end of the upright cylindrical standard 4 is secured to the transverse attachment member 7 so as to enable the sleeve 16, on which an arcuately movable support frame 20 is journaled, to swing freely beneath the frame 12 of the tractor, upon actuation of fluid cylinder 22, which is pivotally mounted at one end to the tractor frame 12 and has a plunger 24 pivotally connected to a lever 26, which lever is secured, as by welding, to the sleeve 16, near the upper end thereof, so, upon movement of the plunger 24 of hydraulic cylinder 22, the arcuately movable support frame 20 may be moved from a position against abutment 28, as shown in dashed outline in FIG. 3, to a similar position, of almost 90° to contact the other abutment 28 on the opposite side of a vertical, longitudinal plane which passes medially through the tractor 1.

It is to be pointed out that the entire sweeper mechanism, embodying support beam 6, transverse attachment member 7, arcuately movable support frame 20 and all the mechanisms attached thereto, as shown in FIG. 6, may be removed from or attached to a high clearance tractor, which precludes the necessity of purchasing the unit mounted on a high clearance tractor at the factory, as the unit, as shown in FIG. 6, may be removed so the high clearance tractor may be put to other uses, with other attachments. By having the unit, as shown in FIG. 6 readily attachable to a high clearance tractor, it may be shipped from the factory for installation on any suitable high clearance tractor in a minimum of time.

The arcuately movable support frame 20 is composed of an upper tubular beam 30 and a lower tubular beam 32, each of which tubular beams has a sleeve 34 and 36, respectively secured thereon, the axis of which sleeves is common, and is perpendicular to the tubular members 30 and 32 to form a substantially vertical axis.

An upright cylindrical tubular member 38 is fitted within tubular sleeves 34 and 36. The sleeve 34 is split longitudinally and has out-turned, apertured ears 40 thereon, through which apertures of the respective ears bolts 42 are positioned to bindingly engage the sleeve 34 with the upright tubular member 38.

A brace 44 extends between the parallel tubular beams 30 and 32 and is secured thereto to hold the distal ends of the tubular beams 30 and 32 a spaced distance apart. A mounting frame has a sleeve 46 which is journaled on upright cylindrical tubular member 38, which sleeve 46 has the lower end thereof in bearing relation with a thrust

bearing 48 which is interposed between the lower end of the sleeve 46 and the sleeve 36 on tubular beam 32, to enable the brush frame mounting sleeve 46 to be arcuately movable in a manner which will be more fully brought out hereinafter.

A mounting frame 50 extends horizontally outward from opposite sides of the frame mounting sleeve 46 and each member 50 has pairs of apertured lugs 52 secured to the end thereof, the apertures of which pairs of apertured lugs are adapted to receive a pivot pin 54 therethrough and through the apertures in the ends of arms 56. The outer end of each which arm has a bearing 58 thereon to journal a shaft 60 therein. A rotatable element or brush 62 is mounted on shaft 60.

A power transmission drive member, such as a sprocket 64 is secured to one end of brush shaft 60 and has an endless transmission element such as a sprocket chain 66 therearound and around a transmission drive member such as a sprocket 68 which is mounted on the shaft of motor 70, which motor is preferably fluid driven, such as by hydraulic fluid, so upon directing fluid, under pressure, through hose 72 and 73, the motor 70 rotates sprocket 68 to drive chain 66 and sprocket 64 to rotate brush 62. The endless transmission element 66 may be either a chain or a belt, and the drive member 68 may be either a sprocket or a pulley, or a power train of gears may be used to drive the shaft 60.

The arms 56 have upstanding brackets 74 secured thereon, as by welding, which brackets mount dust shield 76 which is a spaced distance from the brush 62, as will best be seen in FIGS. 1, 2, 3 and 4. The sweeper brush 62, FIG. 6, is shown with the dust shield removed, in order to show the details of construction and the operation of the brush mechanism. One of the brush frame mounting members 50 has a pair of upstanding, apertured brackets 78 thereon, which pivotally mount a single acting fluid cylinder 80 thereon, which cylinder has a fluid line 82 which leads thereto. A plunger 84 extends outward from the lower end of the cylinder 80 and pivotally connects with a lever 86, which lever is secured to a transverse shaft 88, which shaft 88 is journaled on outstanding lugs 90 which are secured to the brush frame mounting members 50.

Upon actuation of plunger 84, the lever 86 will be moved through an arc to rotate the lever 86, which is secured to shaft 88, and rotates therewith. The shaft 88 has an outwardly extending apertured lever 92 near each end thereof, to each lever 92 a linkage 94 is pivotally connected near one end thereof by the respective pins or bolts 95. The other end of each linkage is pivotally connected to one of the lugs 96, by bolts 98. A spring 100 is biased between an arm 56, and the respective upstanding, apertured support members 102 mounted on the brush frame mounting members, near the distal ends thereof. A screw threaded eye 104 is attached to each upstanding support member 102 and to chains 106 and to an end of each of the springs 100. A portion of the weight of brush 62 may be supported by the springs 100 to enable the weight of the brush to engage the pavement or roadway to the desired extent by adjusting the screw threaded eye bolts 104.

When it is desired to raise the brush, a valve 108, near the driver's station, is actuated to direct hydraulic fluid, under pressure, from a reservoir 110, through suction line 112, pump 114, through fluid line 115 and through valve 108 into fluid line 82 to actuate the plunger 84 in fluid cylinder 80, which, when the valve 108 is in one position, will rotate shaft 88 to lift arms 56 and brush 62. However, when the valve is moved to another position, the fluid is allowed to exhaust from cylinder 80 through fluid line 82, through valve 108 and return pipe 116 to reservoir 110.

A fluid line 118 leads from the plunger end of the cylinder 22, to control valve 120, and into a fluid line 122 which leads from the opposite end of the cylinder to the control valve 120. Upon actuation of the valve 120, in one direction, fluid will be directed from reservoir 110,

through suction line 112, through pump 114, through fluid line 115 to valve 120, and with fluid being directed into fluid line 118 to the plunger end of fluid cylinder 22, the lever 26 will be moved into the position, as indicated in dashed outline in FIG. 2, by plunger 24. The fluid will be exhausted from the opposite end of cylinder 22 through fluid line 122 to valve 120, and through fluid return line 116 to reservoir 110. If the fluid is directed from valve 120 into fluid line 122, the plunger 24 of cylinder 22 will be projected outwardly to move the arcuately movable frame 20 through approximately 90° to contact the frame with the abutment 28 on transverse support beam 6. The arcuately movable frame 20 may be positioned at any intermediate position between the abutments 28. An abutment 28 is provided to limit the movement of the frame 20 in each direction, with respect to the axis of upright cylindrical standard 4.

The brace 44 has an outwardly extending, apertured lug 124, which mounts a bolt or screw threaded shaft 126 between tubular beams 32 and lug 124. A support member 128 is mounted on the lower portion of the shaft 126, which member forms a support for horizontally disposed disc 130, which disc is journaled on non-rotatable shaft 126. Nuts 127 are provided on the upper end of bolt or shaft 126 to hold the upper end of the shaft in secure relation against longitudinal movement.

The disc 130 has spaced apart, apertured lugs 132 and 134 thereon, each of which lugs is adapted to receive an eye bolt 136 and 138, respectively through the respective apertures thereof, with the end of each eye bolt being connected to a pin in the respective reaches of a flexible element such as chains 140 and 142, so as to adjustably secure the chain to the periphery of the disc 130. The other ends of the respective reaches of chains 140 and 142 each have a pin therein which passes through apertures in the apertured lug 144. The apertured lug 144 is fixedly secured to brush frame mounting sleeve 46. The reaches of the chains 140 and 142 are preferably of the same length, and are drawn into taut relation by the eye bolts 136 and 138.

The upright sleeve 16 has an apertured lug 146 secured thereto, on which lug a fluid actuated cylinder 148 is pivotally mounted by a pin 150. The opposite end of fluid actuated cylinder 148 has a plunger 152 therein, which pivotally connects to a crank pin 154 mounted on a side of disc 130. Upon actuation of cylinder 148, to move plunger 152 relative thereto, the disc 130 will be rotated about the axis of shaft 126, and since the thickness of the disc 130 is not greater than the distance between the innermost plates of the reaches of the chains 140 and 142, the reaches of the chains will be held in guided relation thereon to rotate disc 130 relative to the axis of shaft 126, which movement of the reaches of chains 140 and 142 will also rotate sleeve 46 to rotate the sleeve about upright cylindrical tubular member 38, which will rotate brush frame mounting members 50 about the axis of upright tubular member 38, which, in turn, will rotate the entire brush assembly, which is mounted on arms 56, from the position, such as indicated in dashed outline in FIG. 3 to that indicated in full outline therein.

The sleeve 46, which mounts the brush mounting frame 50, arms 56, the brush 62 and the drive mechanism therefor, may be rotated independently of or simultaneously with the arcuately movable support frame 20 by the actuation of fluid actuated cylinder 22, which moves the arcuately movable support frame 20 about the axis of upright cylindrical standard 4.

The fluid cylinder 148 has a fluid line 156 leading from the plunger end thereof to a valve 158, and has a fluid line 160 leading from the opposite end of cylinder 148 to valve 158. Upon actuation of valve 158 into one position, fluid will be directed from reservoir 110, upward through suction line 112 through pump 114, fluid line 115 and through valve 158 into fluid line 160, which will cause the plunger 152 of cylinder 148 to be projected,

as indicated in FIGS. 4 and 6, which will rotate disc 130 arcuately to rotate sleeve 46 in one direction, to a position such as shown in dashed outline, FIG. 3, which in the present instance, is in stepped-up geared relation of approximately two to one, between the disc 130 and the sleeve 46, which will position the brush at an angle with respect to arcuately movable support frame 20. In so doing, the fluid from the opposite end of cylinder 158 will be discharged into fluid line 156 into valve 158 and out through fluid discharge line 116 to the reservoir 110. Upon actuation of valve 158 into another position, fluid will be directed from reservoir 110, through suction line 112, pump 114, valve 158 into fluid line 156, to move plunger 152 in cylinder 148 to a retracted position, which will rotate the disc 130 about the axis of shaft 126 in the opposite direction, to rotate the brush frame mounting sleeve 46 in coordinated relation therewith, with brush frame mounting members 50, arms 56 and brush 62, including the fluid driving mechanism therefor, being rotated into a position such as shown in full outline in FIG. 3.

Due to the high clearance of the tractor 1, the arcuately movable support frame 20 and brush 62, mounted on shaft 60, may be moved freely beneath the frame 12 of tractor 1. It is to be pointed out that the tractor 1 has a relatively short wheel base, and that the driver thereof occupies a seat which is relatively high above the roadway being acted upon by brush 62.

By utilizing a tractor 1 which has a relatively short wheel base, the unit can be operated in close areas, as it has a short turning radius for maneuvering in close areas. The present arrangement, is shown with a 76" front and rear tread, and a 98" wheel base. The mechanism will allow the brush 62 to shift 72" laterally, as well as to be angulated 30° either to the right or to the left.

By manipulation of valves 120 and 158, the frame 20 may be moved about the axis of upright cylindrical standard 4 and then, the brush may be angulated to the desired angle to pass between wheels 10 and 11 of the tractor, and the brush 62 set at any desired angle of operation with respect to the line of travel of the tractor, and to either side of the tractor 1, or beneath the tractor 1. This gives complete maneuverability in moving the brush outwardly between the wheels, and then angulating the brush to the desired angle. At the maximum angle, the brush may be moved back beneath the tractor 1 which, without manipulating the valve 158 to move the brush into a position such as shown in FIGS. 1 and 2.

The valve 162 is provided in fluid lines 72 and 73, so the fluid may be directed from reservoir 110, through suction line 112, through pump 114 into fluid line 115, through valve 162 to direct fluid into fluid line 72 through fluid motor 70 to rotate sprocket 68, which, in turn, will drive chain 66 to drive sprocket 64, which is secured to shaft 60, which, in turn, will rotate the brush in the direction desired to perform the sweeping action on the street or roadway, if the rotary brush 62 is in engagement therewith.

Upon rotation of fluid driven motor 70, fluid will be discharged through fluid line 73, through valve 162 into discharge line 116 into reservoir 110. The speed of the brush may be accurately controlled by valve 162.

The operation raising and lowering the brush has been set out hereinbefore.

MODIFIED FORM OF THE INVENTION

A modified form of the invention is shown in FIGS. 7 through 11, which form of the invention uses that same type tractor as the aforementioned form of the invention and utilizes the same type rotatable brush pivoted about an upright axis, as the aforementioned form of the invention. However, the present form of the invention utilizes a pair of spaced apart, parallel, transverse tracks or channels 201, which are secured to the lower side of the

frame 12 of tractor 1. The channels 201 have an end member 202 extending therebetween near each end thereof, which end members serve as braces and as a limiting stop for transversely movable, wheeled, support frame, designated generally as 204, which wheeled support frame has pairs of wheels or rolling members 206 journaled thereon near each end thereof, which wheels or rolling members fit within inturned channels 201.

One of the channels 201 has a shaft 208 rotatably mounted near one end and a shaft 210 mounted near the other end thereof. A motor 212 is connected in driving relation with shaft 208 and is supported on the channel 201. The present motor is indicated as being a fluid motor. A sprocket 214 is fixedly secured to shaft 208 and rotatable therewith. A sprocket 216 is mounted on shaft 210 and rotatable about the axis thereof. A transmission chain 218 is secured to one end of the wheeled support frame and passes around sprocket 214 and around sprocket 216 and is connected to the opposite end of the wheeled frame 204, as will best be seen in FIG. 8.

Upon rotation of sprocket 214 by fluid motor 212 in one direction, the wheeled support frame will be moved in one direction and upon the fluid motor 212 rotating the shaft 208 in the opposite direction, the wheeled support frame 204 will be moved in the opposite direction. The channels 201 may be of any desired length, however, it is preferable that these be long enough to enable the wheeled support frame, on which a rotary brush assembly 220 is mounted, to move the brush outward between the wheels 10 and 11 of the tractor 1, so as to enable the sweeping of the roadway as the sweeper moves over the terrain. The wheeled support frame 204 has a downwardly depending axle member 222 secured to the lower side thereof on which an elongated sleeve 224 is rotatably mounted. A support plate or thrust bearing 226 is mounted on and secured to the lower end of downwardly depending axle member 222 and it is preferably held in place by bolts 228 which enable the ready removal of the entire rotatable element or brush assembly 220, as will be more fully brought out hereinafter.

The control for raising and lowering the rotatable element or brush is substantially the same as the aforementioned form of the invention. The sleeve 224 has outwardly extending arms 230 on each side thereof on which forwardly extending arms 232 are mounted for arcuate movement.

The arms 232 each have a bearing 234 near the respective outer ends thereof to journal a horizontal brush shaft 236 so as to enable a brush 238 to be rotated about the axis thereof. A sprocket 240 is associated with one end of the rotatable element or broom 238 and fixedly secured thereto for rotation therewith. A sprocket 242 is mounted about the pivot point of forwardly extending arms 232 and has a hydraulic motor 244 associated therewith and connected in driving relation with the sprocket 242. A transmission drive chain 246 surrounds the sprockets 240 and 242 to connect the motor 244 in driving relation therewith.

Fluid conduits 248 and 250 lead to hydraulic motor 244 and a control valve is provided to selectively control the fluid, under pressure, from a fluid pump (not shown) to the fluid motor 244, so as to rotate the rotatable brush 238 the desired revolutions per minute. An upstanding support member 252 is mounted on the outstanding arms 230 to pivotally mount a fluid cylinder 254 therein, so upon manipulation of a fluid actuated valve, the fluid cylinder 254 will retract the plunger 256 to lift the brush housing assembly 258 so that the brush 238 will properly engage the surface of the road being swept. Further upright supports 260 are mounted on outwardly extending arms 230, one near each end thereof, which support members are apertured to receive support bolts 262 therethrough to which ends of tension springs 264 are adjustably attached. The other end of the springs 264 are selectively connected to respectively apertured lugs 266 on forwardly extending

arms 232, thereby enabling a smaller cylinder to be used and a more sensitive control on the raising and lowering of the rotatable brush 238. The rotatable brush 238 has a dust shield 268 mounted over a portion thereof to shield dust from the operator and the mechanism. A fluid conduit 255 leads from the lower end of fluid cylinder 254 to a suitable control valve and source of fluid pressure.

The elongated sleeve 224 has an outwardly extending lever 270 to which is pivotally connected the distal end of plunger 272, which plunger is mounted in a fluid cylinder 274, pivotally mounted on a bracket 276 on transversely movable wheeled support frame 204. Fluid conduits 278 and 280 lead from opposite ends of the fluid cylinder 274 and to a suitable control valve and source of fluid, under pressure, to actuate the plunger 272 within the cylinder to move lever 270 and sleeve 224 arcuately about downwardly depending axle member 222. In so doing, the outwardly extending arms 230 and forwardly extending arms 232 will move brush assembly 220 about the axis of axle member 222, however, the motor 244 will drive the rotatable brush 238 at any angle, as the conduits leading to the motor 244 are flexible. Furthermore, the flexibility of the conduits which lead from motor 244, are such to enable the rotary brush 238 to be raised and lowered while the sweeper is being moved over the terrain.

Upon rotating shaft 208 the transversely movable wheeled support frame 204 may be moved at the desired location anywhere intermediate the ends of channels 201, which will enable the rotary brush 238 to sweep either directly below the frame 12 or outward between and beyond the track width of wheels 10 and 11 and the brush may be angulated at any angle, such as indicated in FIG. 9 in full outline and in dashed outline, thereby giving a completely flexible unit, which brush is fully contained within the wheel base of the tractor 1.

When it is desired to remove the brush assembly 220 from the axle member 222, the fluid conduits may be disconnected from the motors and cylinders on the brush assembly, and by removing bolts 228 and plate or thrust bearing 226, the elongated sleeve 224 may be moved downward, and with the tractor being in elevated position, the unit may be removed from replacement of another unit or other apparatus, such as an elongated, flail type mower.

Having thus clearly shown and described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A power driven, mobile sweeper for sweeping surfaces, which sweeper comprises;

- (a) a wheeled frame,
- (b) a power unit mounted on said wheeled frame and being connected in driving relation therewith for movement of said wheeled frame over the terrain,
- (c) a support frame pivotally mounted on said wheeled frame to swing about an upright axis only in constant spaced relation thereto, which support frame extends therebelow for a portion of the length thereof for arcuate movement of a portion thereof in a plane parallel to the surface over which said wheeled frame is moved,
- (d) a brush mounting frame pivotally mounted on said support frame for arcuate movement about an upright axis,
- (e) a brush rotatably mounted on said brush mounting frame for rotation about a horizontal axis,
 - (1) adjusting means on said brush mounting frame to adjust said brush with respect to the terrain over which said wheeled frame is moved,
- (f) a first power means associated with said wheeled frame and with said support frame for moving said support frame arcuately with respect to said wheeled frame,
- (g) a second power means associated with said support frame and with said brush mounting frame for mov-

ing said brush mounting frame about the upright axis thereof,

- (g) (1) said brush mounting frame being adapted to be moved laterally, by said first power means so said brush will be moved outwardly between the wheels beyond the line of travel of the wheels of said wheeled frame on either side thereof, and

- (h) a third power means associated with said brush to rotate said brush about the horizontal axis thereof.

2. A power driven, mobile sweeper, as defined in claim 1; wherein

- (a) said first power means associated with said wheeled frame and with said support frame for movement of said support frame about said upright axis thereof includes,

- (1) a fluid pressure generating means associated with said power unit in driven relation,

- (2) said first power means being a fluid actuated cylinder pivotally connected to said wheeled frame and to said support frame,

- (3) fluid lines interconnecting said fluid pressure generating means and said fluid actuated cylinder, and

- (4) control valve means within said fluid lines to selectively control fluid from said fluid pressure generating means into said fluid actuated cylinder, so as to control the movement of said support frame about the upright axis thereof.

3. A power driven, mobile sweeper, as defined in claim 1; wherein

- (a) said second power means associated with said brush mounting means includes,

- (1) fluid pressure generating means associated with said power unit in driven relation,

- (2) said second power means being a fluid actuated cylinder, which cylinder is pivotally connected to said support frame and to said brush mounting frame,

- (3) fluid lines interconnecting said fluid pressure generating means and said fluid cylinder, and

- (4) control valve means within said fluid lines to selectively control fluid from said fluid pressure generating means to said fluid actuated cylinder, so as to control the movement of said brush mounting frame about the upright axis thereof.

4. A power driven, mobile sweeper, as defined in claim 3; wherein

- (a) said third power means associated with said brush to rotate said brush about the horizontal axis thereof is a fluid motor,

- (b) fluid lines interconnecting said fluid pressure generating means and said fluid motor,

- (b) (1) control valve means within said fluid lines leading to said fluid motor to selectively control fluid from said fluid pressure generating means to said fluid motor, and

- (c) an endless transmission means connected in power transmitting relation with said fluid motor and with said brush to rotate said brush about the horizontal axis thereof.

5. A power driven, mobile sweeper, as defined in claim 1; wherein

- (a) a fluid pressure generating means is associated with said power unit in driven relation,

- (b) said first power means associated with said wheeled frame and with said support frame for movement of said support frame about said upright axis thereof is a first fluid actuated cylinder, having a plunger therein, which plunger-cylinder unit is pivotally connected to said wheeled frame and to said support frame,

- (c) first fluid lines interconnecting said fluid pressure generating means and said first fluid actuated cylinder,

- (d) first control valve means within said first fluid lines to selectively control fluid from said fluid pressure

generating means into said first fluid actuated cylinder, so as to control the movement of said support frame about the upright axis thereof,

- (e) said second power means associated with said support frame and with said brush mounting frame being a second fluid actuated cylinder,

- (f) second fluid lines interconnecting said fluid pressure generating means and said second fluid actuated cylinder,

- (g) second control valve means within said second fluid lines to selectively control fluid from said fluid pressure generating means into said second fluid actuated cylinder, so as to control the movement of said brush mounting frame about the upright axis thereof,

- (h) said third power means associated with said brush to rotate said brush about a horizontal axis is a fluid motor,

- (i) third fluid lines interconnecting said fluid pressure generating means and said fluid motor,

- (j) third control valve means within said third fluid lines to selectively control fluid from said fluid generating means into said fluid motor, so as to control the speed of said motor, and

- (k) endless transmission means connected in power transmission relation with said fluid motor and with said brush, to rotate said brush about said horizontal axis.

6. A power driven, mobile sweeper for sweeping surfaces, which sweeper comprises;

- (a) a first frame,

- (1) wheels operatively mounted on said first frame in supporting relation,

- (b) a power unit mounted near the top of said first frame, forward of the center thereof, and connected in driving relation with the wheels thereon to propel said first frame over the terrain,

- (c) a support frame comprising spaced apart, laterally extending beams, mounted on said first frame and extending therebelow in pivotal relation about an upright axis which is associated with said first frame,

- (1) a portion of said support frame adapted to swing in a plane parallel to the surface over which the wheels of said first frame are moved,

- (d) a brush mounting frame pivotally mounted on an upright axis for arcuate movement about the axis thereof near the outer ends of said laterally extending beams of said support frame,

- (e) a brush rotatably mounted on a substantially horizontal axis on said brush mounting frame,

- (1) adjusting means on said brush mounting frame to adjust said brush with respect to the terrain over which the wheels of said first frame are moved,

- (f) a first power means associated with said first frame and with said second frame to move said support frame arcuately about the upright axis on said first frame,

- (g) a second power means associated with said support frame and with said brush mounting frame to move said brush mounting frame about the upright axis on said support frame to enable said brush mounting frame, rotatably mounting said brush, to be moved outwardly between the wheels of said first frame beyond the line of travel thereon on either side of said first frame,

- (1) said brush being adapted to be angularly positioned by a combination of movements of said first and second power means, while the brush is extended outward beyond the line of travel of the wheels of said first frame, and

- (h) a third power means associated with said brush to rotate said brush about the horizontal axis thereof.

7. A power driven, mobile sweeper for sweeping surfaces, which sweeper comprises;

- (a) a wheeled frame,

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- (b) a support frame pivotally mounted, for movement about an upright axis, on said wheeled frame, which support frame extends therebelow, within the length thereof, for arcuate movement with respect thereto,
 - (c) a brush mounting frame pivotally mounted, on an upright axis, on said support frame for arcuate movement about said upright axis and for lateral movement with respect to said wheeled frame,
 - (d) a brush rotatably mounted, on a horizontal axis, on said brush mounting frame for rotation of said brush about said horizontal axis,
 - (e) a power unit mounted near the top of said wheeled frame, forward of a vertical transverse plane passing through the axis of the rotatable brush, which power unit is connected in driving relation with the wheels of said wheeled frame to propel said wheeled frame over the terrain,
 - (f) an elevated operator seat mounted on the top of said wheeled frame and being positioned above a horizontal plane which is tangential to the upper surface of said rotatably mounted brush,
 - (g) a first power means associated with said wheeled frame and with said support frame for moving said support frame and said brush laterally so said brush will be moved outward beyond the line of travel of said wheels of said wheeled frame on either side thereof,
 - (h) a second power means associated with said support frame and with said brush mounting frame for moving said brush mounting frame about the upright axis thereof, and
 - (i) a third power means associated with said brush to rotate said brush about the horizontal axis thereof.
8. A power driven, mobile sweeper for sweeping surfaces, which sweeper comprises;
- (a) a wheeled frame,
 - (1) a transverse track mounted on said wheeled frame on the lower side thereof,
 - (b) a power unit mounted on said wheeled frame and being connected in driving relation therewith for movement of said wheeled frame over the terrain,
 - (c) a support frame mounted on said wheeled frame for transverse movement with respect to said wheeled frame,
 - (1) rolling members interposed between said support frame and said transverse track,
 - (d) a brush mounting frame pivotally mounted on said support frame for arcuate movement about an upright axis,
 - (1) said brush mounting frame being connected to said support frame for moving said frame laterally along said track,
 - (e) a brush rotatably mounted on said brush mounting frame for rotation about a horizontal axis,
 - (f) a first power means associated with said wheeled frame and with said support frame for moving said support frame transversely with respect to said wheeled frame,
 - (g) a second power means associated with said support frame and with said brush mounting frame for moving said brush mounting frame about the upright axis thereof, and
 - (h) a third power means associated with said brush to rotate said brush about the horizontal axis thereof.
9. A power driven mobile sweeper for sweeping surfaces, as defined in claim 8; wherein
- (a) said transverse track is formed of parallel, spaced apart, intumed channels,
 - (b) the rolling members on said support frame are wheels fitted within said intumed flanges of said channels, and
 - (c) said first power means, connected to said support frame, is a drive mechanism comprising sprockets, chain and a fluid motor.

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- 10. A power driven mobile sweeper for sweeping surfaces, as defined in claim 9; wherein
 - (a) said fluid motor, associated with said chain and sprocket drive mechanism, is a rotary fluid motor.
- 11. A power driven mobile sweeper for sweeping surfaces, as defined in claim 8; wherein
 - (a) a downwardly depending axle member is secured to the lower side of said support frame,
 - (b) an elongated sleeve journaled on said downwardly depending axle member,
 - (c) said brush mounting frame is mounted on said elongated sleeve to rotatably support said brush therein, and
 - (d) a thrust plate removably attached to the lower end of said downwardly depending axle member to support said elongated sleeve.
- 12. A power driven, mobile unit for acting upon the surface of the terrain, which unit comprises;
 - (a) a wheeled frame, the wheels of which are spaced apart longitudinally and support said frame,
 - (b) a power unit mounted on said wheeled frame and being connected in driving relation therewith for movement of said wheeled frame over the terrain,
 - (c) a support frame pivotally mounted on said wheeled frame to swing about an upright axis only in constant spaced relation thereto, which support frame extends therebelow for a portion of the length thereof for arcuate movement of a portion thereof in a plane parallel to the surface over which said wheeled frame moves,
 - (1) said support frame being mounted on said wheeled frame and supported therebelow for pivotal movement about an upright axis,
 - (d) a mounting frame pivotally mounted on and supported below said support frame for arcuate movement about an upright axis,
 - (1) said mounting frame being positioned between vertical planes passing through the axes of said longitudinally spaced apart wheels,
 - (2) said upright axis of said mounting frame being arcuately shiftable with respect to a vertical medial plane passing longitudinally through said wheeled frame,
 - (e) a rotatable element mounted on and extending below said mounting frame for rotation about a horizontal axis,
 - (1) adjusting means on said mounting frame to adjust said rotatable element with respect to the terrain over which said wheeled frame is moved,
 - (f) a first power means associated with said wheeled frame and with said support frame for moving said support frame arcuately with respect to said wheeled frame,
 - (g) a second power means associated with said support frame and with said mounting frame for moving said mounting frame about the upright axis thereof,
 - (1) said mounting frame mounting said rotatable element being adapted to be moved laterally by said first power means so said rotatable element will be moved outwardly between the wheels beyond the line of travel of the wheels of said wheeled frame on either side thereof,
 - (h) a third power means associated with said rotatable element to rotate said element about the horizontal axis thereof.
- 13. A power driven, mobile sweeper for sweeping surfaces, which sweeper comprises;
 - (a) a wheeled frame,
 - (b) a power unit mounted on said wheeled frame and being connected in driving relation therewith for movement of said wheeled frame over the terrain,
 - (c) a support frame mounted on said wheeled frame to move laterally in constant spaced relation thereto, a portion of which support frame extends below said wheeled frame for movement in a plane parallel to

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- the surface over which said wheeled frame is moved,
- (d) a brush mounting frame pivotally mounted on said support frame for arcuate movement about an upright axis,
- (e) a brush rotatably mounted on said brush mounting frame for rotation about a horizontal axis, 5
- (1) adjusting means on said brush mounting frame to adjust said brush with respect to the terrain over which said wheeled frame is moved,
- (f) a first power means associated with said wheeled frame and with said support frame for moving said support frame laterally with respect to said wheeled frame, 10
- (g) a second power means associated with said support frame and with said brush mounting frame for moving said brush mounting frame about the upright axis thereof, 15
- (1) said brush mounting frame being adapted to be moved laterally by said first power means so said brush will be moved outwardly between the wheels and beyond the line of travel of the wheels of said wheeled frame on either side thereof, 20
- (h) a third power means associated with said brush to rotate said brush about a horizontal axis thereof. 25
14. A power driven, mobile unit for acting upon the surface of the terrain, which unit comprises;
- (a) a wheeled frame,
- (b) a power unit mounted on said wheeled frame and being connected in driving relation therewith for movement of said wheeled frame over the terrain, 30

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- (c) a support frame mounted on said wheeled frame to move laterally in constant spaced relation thereto, a portion of which support frame extends below said wheeled frame for movement in a plane parallel to the surface over which said wheeled frame is moved,
- (d) a mounting frame mounted on said support frame,
- (e) a rotatable element mounted on said mounting frame for rotation with respect thereto,
- (1) adjusting means on said mounting frame to adjust said rotatable element with respect to the terrain over which said wheeled frame moves,
- (f) a first power means associated with said wheeled frame and with said support frame for moving said support frame laterally with respect to said wheeled frame,
- (g) further power means associated with said rotatable element on said mounting frame to rotate said rotatable element,
- (1) said mounting frame being adapted to be moved laterally by said first power means so said rotatable element will be moved outwardly between the wheels beyond the line of travel of said wheeled frame on either side thereof.

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EDWARD L. ROBERTS, Primary Examiner