July 27, 1954 LE GRAND H. LULL 2,684,496

PICKUP AND DUMP STREET SWEEPER

Filed Jan. 18, 1950 5 Sheets-Sheet 1

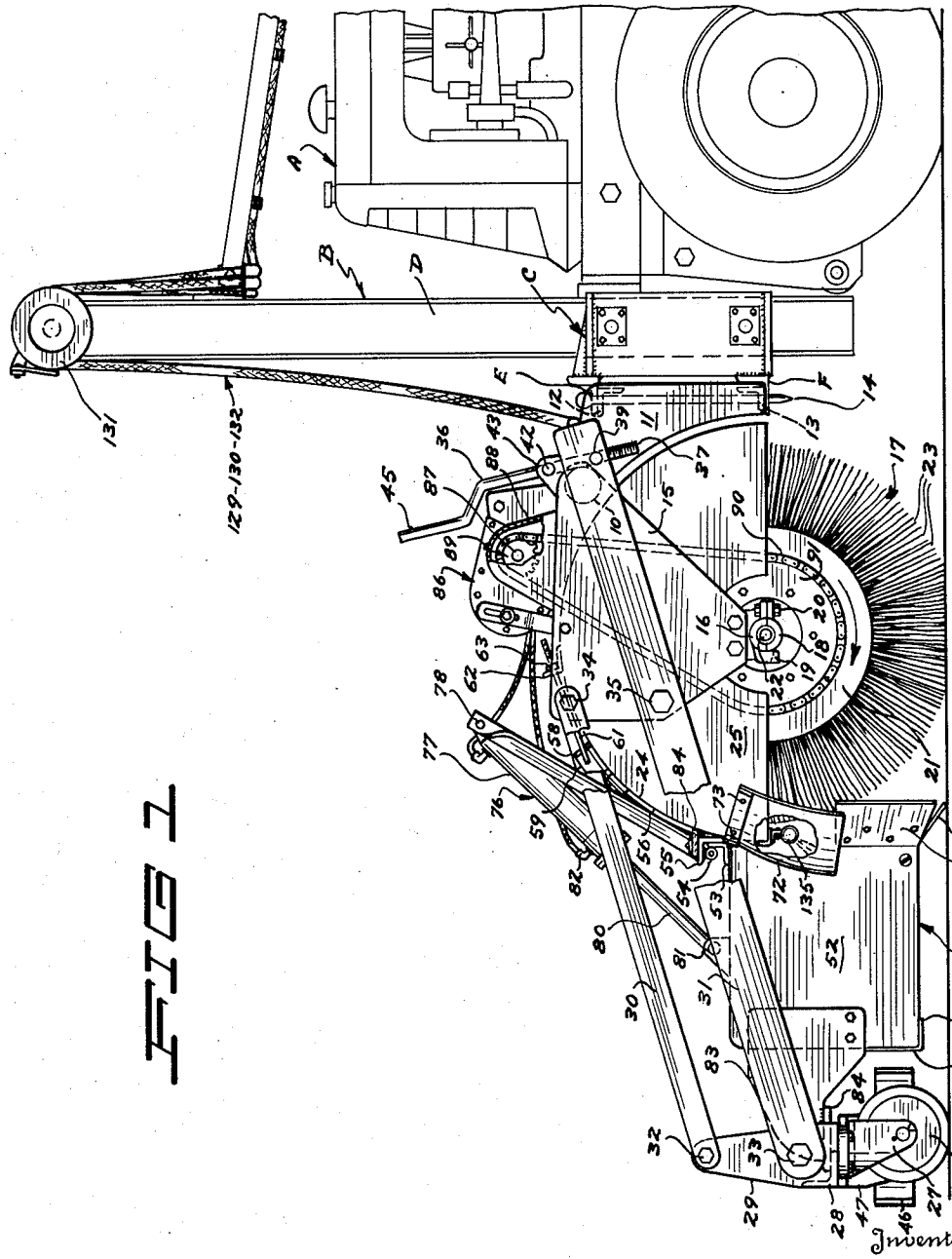


FIG 1

Inventor
LE GRAND H. LULL

By Carlson & Hayes
Attorneys

July 27, 1954 LE GRAND H. LULL 2,684,496

PICKUP AND DUMP STREET SWEEPER

Filed Jan. 18, 1950 5 Sheets-Sheet 2

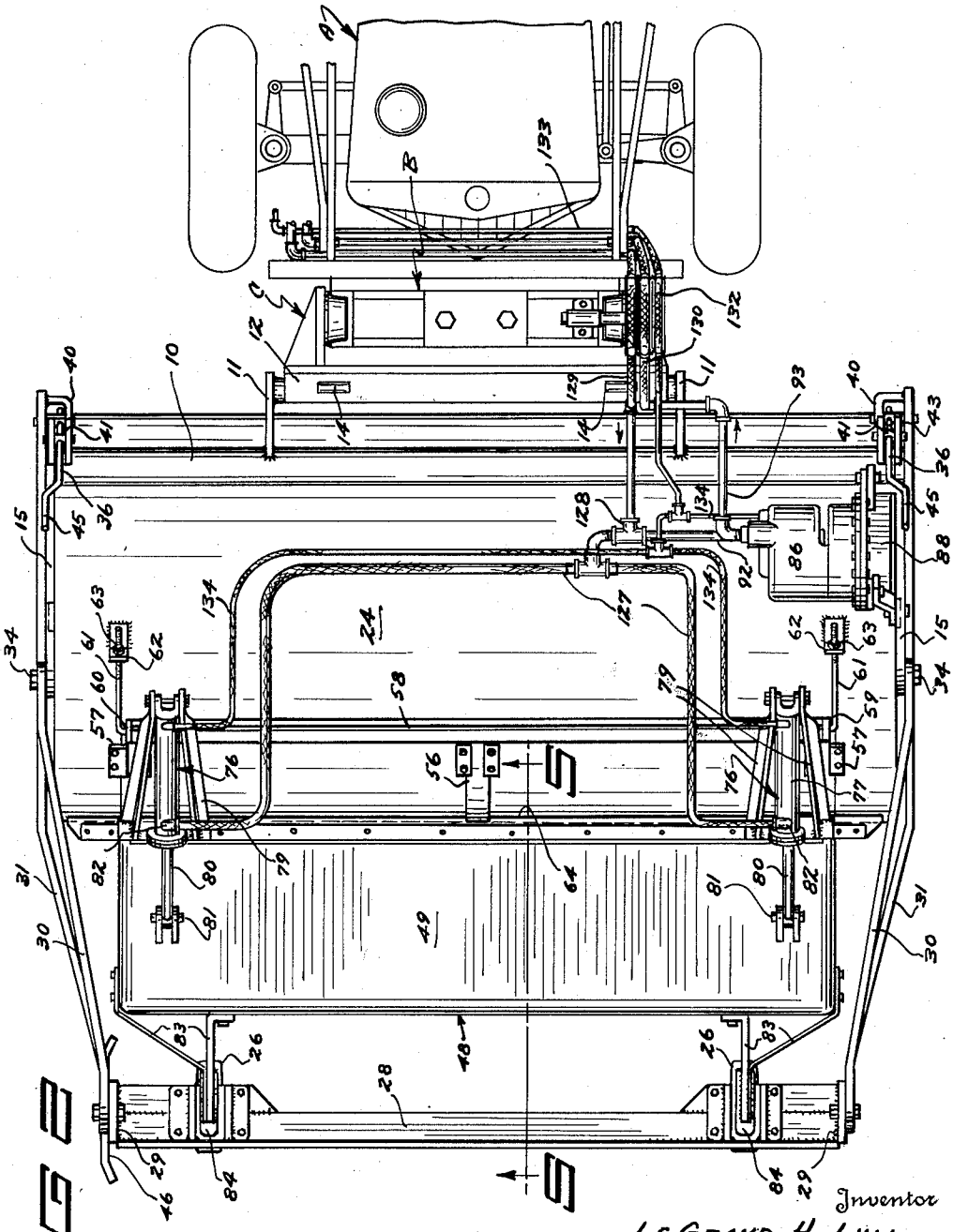


FIG 2

Inventor
LE GRAND H. LULL

By Carlson & Hazle
Attorneys

July 27, 1954 LE GRAND H. LULL 2,684,496

PICKUP AND DUMP STREET SWEEPER

Filed Jan. 18, 1950 5 Sheets-Sheet 3

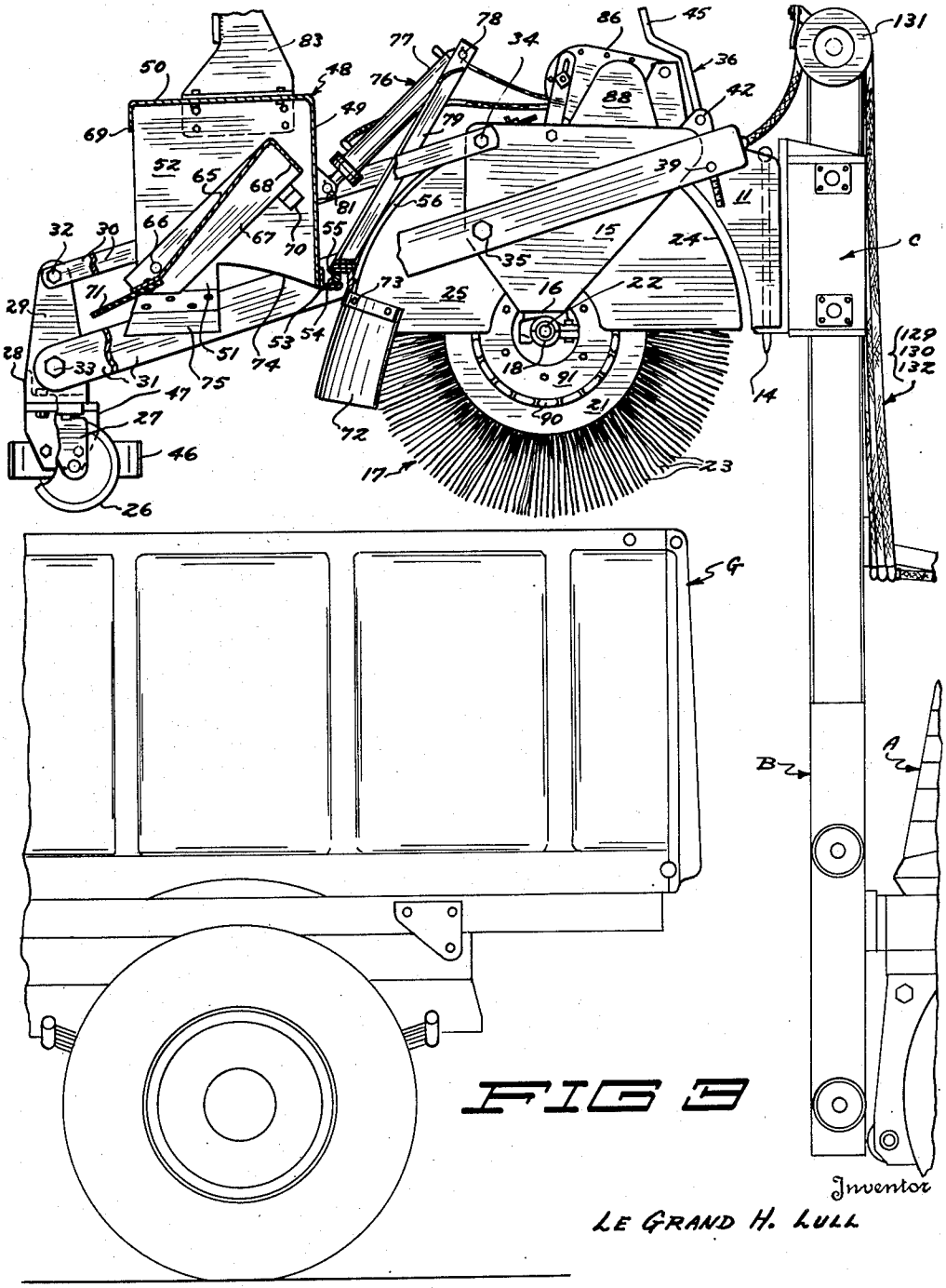


FIG 3

Inventor
LE GRAND H. LULL

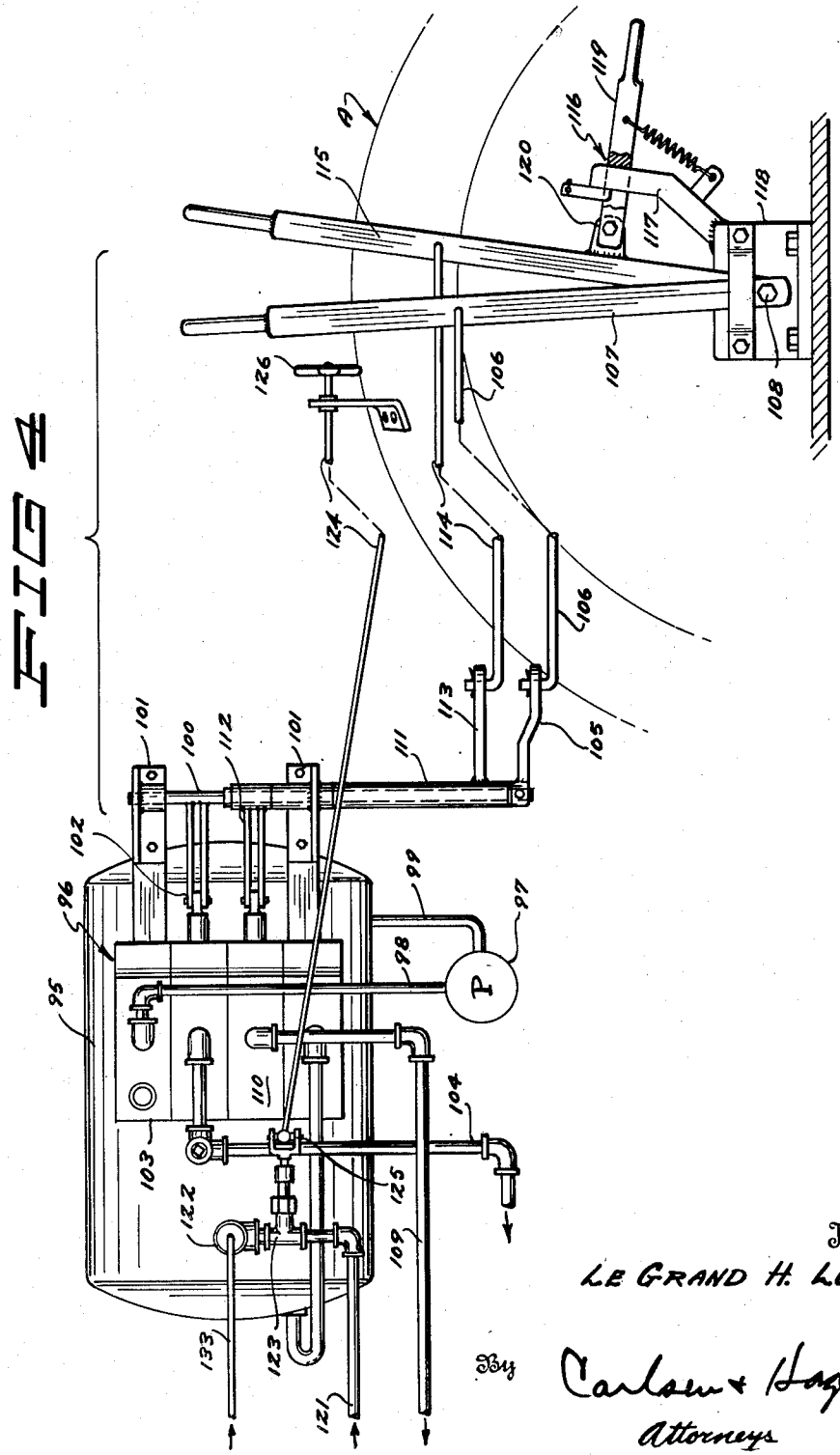
By Carlson & Hazle
Attorneys

July 27, 1954 LE GRAND H. LULL 2,684,496

PICKUP AND DUMP STREET SWEEPER

Filed Jan. 18, 1950 5 Sheets-Sheet 4

FIG 4



Inventor
LE GRAND H. LULL
By Carlson & Hayle
Attorneys

July 27, 1954 LE GRAND H. LULL 2,684,496

PICKUP AND DUMP STREET SWEEPER

Filed Jan. 18, 1950 5 Sheets-Sheet 5

FIG 5

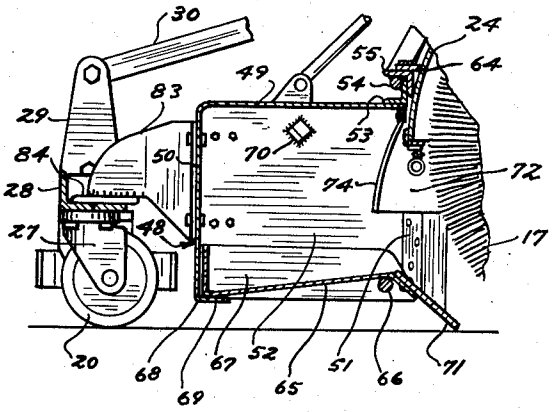


FIG 6

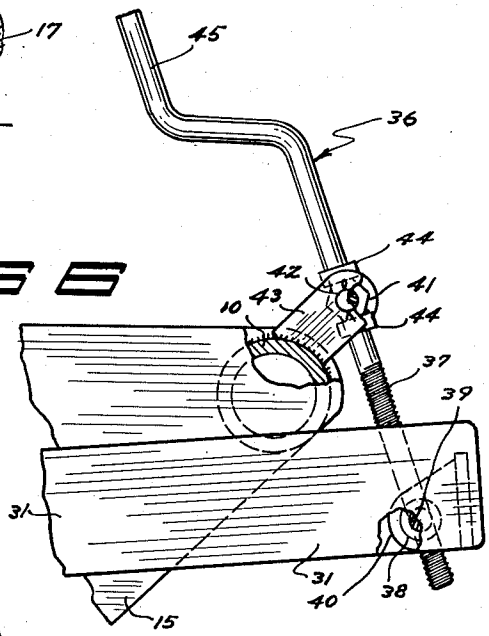
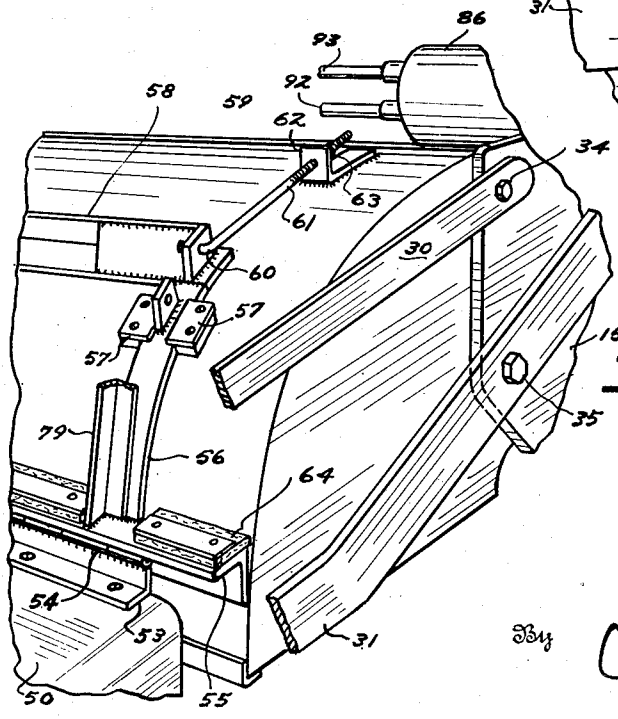


FIG 7



Inventor
LE GRAND H. LULL

By Carlson & Hayle
Attorneys

Patented July 27, 1954

2,684,496

UNITED STATES PATENT OFFICE

2,684,496

PICKUP AND DUMP STREET SWEEPER

Le Grand H. Lull, Minneapolis, Minn.

Application January 18, 1950, Serial No. 139,253

4 Claims. (Cl. 15—83)

1

This invention relates to improvements in street cleaning equipment and the primary object is to provide a machine which will sweep up dust, trash and other debris from the street as the machine travels therealong and will deposit the swept up material continuously in a receptacle for periodic dumping as required.

I am, of course, aware that there have been machines for this general purpose but in accordance with my invention I provide a greatly improved machine which makes possible an entirely new method of street sweeping. Heretofore it has been the practice to sweep up the material from the street and deposit it in piles or windrows and it has been necessary then to use foot labor to shovel the accumulated material into a truck for transport to an ultimate disposal point. As an extremely important object of my invention I provide a machine embodying a sweeping brush and receptacle for accumulating the material and mount this assembly upon a vehicle in such manner that it may be elevated relative to such vehicles and the receptacle tilted over to dump the accumulated material directly into the transport or dump truck. The saving in time and labor will be apparent.

Another object of my invention is to provide a street sweeping machine which is fluid actuated throughout from a source of fluid under pressure upon the operating vehicle and wherein the rotary brush is driven by a fluid motor and the tilting and dumping receptacle is operated by fluid rams. Further in accordance with this object of my invention, I provide a novel hydraulic control and supply system for the fluid motor and rams which permits all necessary control and supply operations by the use of only two essential flexible fluid conduits between the machine and the vehicle. This is of particular importance for the reason that the machine itself is arranged for up and down movements in order to dump from the receptacle directly into a transport truck as stated above and compensation is necessary for taking up the slack in the fluid conduits so that the fewer such conduits that may be used the more simple the construction as a whole.

A further object of my invention is to provide a number of constructional improvements in machines of this type all of which contribute to effective operation and among which are included provision for adjusting the various operating elements in order to compensate for brush wear, along with adjustments to insure continuous and accurate engagement of the brush with the street surface.

These and other more detailed and specific objects will be disclosed in the course of the following specification reference being had to the accompanying drawings, in which—

Fig. 1 is a side elevation with parts broken away of a street sweeper according to my invention showing the same as associated with a conventional tractor and connected thereto by means of a vertically movable frame assembly.

2

Fig. 2 is a plan view of the machine as shown in Fig. 1.

Fig. 3 is another side view with parts broken away and in section but showing the street sweeping machine elevated and disposed over a conventional transport or dump truck with the receptacle tilted upwardly for dumping accumulated swept up debris into the truck.

Fig. 4 is a composite and somewhat schematic showing of the hydraulic fluid supply and control elements with the supply and valve units shown in plan view and the actual control levers shown in side elevation for convenience sake.

Fig. 5 is a fragmentary vertical and longitudinal sectional view along the line 5—5 in Fig. 2.

Fig. 6 is an enlarged fragmentary side elevation shown partially broken away and in section to better illustrate the construction of the gauge wheel adjusting mechanism.

Fig. 7 is an enlarged fragmentary perspective view showing the up and down adjustment of the receptacle by means of which it is adjusted to compensate for brush wear.

Referring now more particularly and by reference characters to the drawings, I have shown my improved street sweeping machine as mounted forwardly of a conventional tractor A of the type now widely used by street maintenance crews and further illustrate the tractor as equipped with a vertically movable frame or loader B which is largely identical to that disclosed in my prior Patent No. 2,394,458 to which attention is invited for details of the loader structure per se. It is sufficient for purposes of the present disclosure to state that the frame or loader B includes a carrier frame C which moves up and down the tower frame D and which has upper and lower, transverse and apertured mounting flanges E and F as shown in Fig. 1. The loader is hydraulically or fluid actuated and as will be noted in Fig. 3 the tower frame D is also raised as the carrier C travels upwardly so that for a given normal height as shown in Fig. 1 a comparatively high lift is obtained, all as outlined in my prior patent.

The street sweeper comprises a main frame, the primary support for which is an elongated transversely extending torque tube 10 to which is rigidly welded spaced bracket plates 11 which are joined at upper and lower rear corners by transverse angles 12 and 13 welded in place. These angles 12 and 13 are so spaced vertically as to accommodate the flanges E and F of the carrier C and the angles and flanges are apertured to receive anchor pins 14 by which the machine is removably mounted upon the carrier as will be

clearly understood. The main frame assembly further includes heavy rigid hanger plates 15 which are welded at rear upper corners at the ends of the torque tube 10 and which are provided with bearings 16 at their lower centers in order to journal a large, circular street sweeping brush, indicated generally at 17. The bearings 16 have quick-connecting detachable caps 18 which hook at 19 in one side of the main portion of the bearings and are secured at opposite sides by single bolts 20. The brush 17 has a large central hub 21 with stub shafts 22 at its ends which journal in the bearing 16 and, of course, has the usual coarse and heavy bristles all about the hub as indicated at 23. The upper portion of the brush is covered by a semi-circular hood 24 having depending end plates 25 which are secured at a number of points to the hanger plates 15 as shown clearly in the drawing.

Forward support is provided for the sweeper by means of a pair of caster wheels 26 journaled in forks 27 which are caster mounted between a cross member 28 which is located well forward of the brush and hood and is, of course, located transversely with reference to the direction of travel. At the ends the cross member 28 has upstanding brackets 29 and at each side of the machine parallel upper and lower links 30 and 31 are provided with their forward ends pivoted in vertical spaced relation at 32 and 33 to said brackets. From these points the links 30 and 31 angle upwardly and rearwardly alongside the hanger plates 15 and they are pivoted to said plates at 34 and 35 at vertically spaced points which are the same distance apart as the pivots 32 and 33. The lower links 31 at each side extend rearwardly past the pivots 35, and beyond the upper rear corner of the hanger plates 15, for the accommodation of cranked adjusting screws or hand screws 36 as best seen in Fig. 6. The lower end of the screws 36 are threaded at 37 and are screwed through nut members 38 which are swivel mounted at 39 upon the rear ends of the links 31 by means of inwardly and forwardly turned clips 40. Upwardly of the links, the screws are rotatably mounted through trunnion fittings 41 which swivel at 42 in ears 43 welded to the extremities of the torque tube 10. Collars 44 at opposite sides of the fittings 41 prevent axial movement of the screws 36 so that as they are turned by their cranks 45 the engagement of the threads 37 with the nut members 38 will obviously swing the links 31 about their pivots 35. There results then a parallel motion of the links 30 and 31 such as to raise and lower the brush with reference to the wheels 26 and this adjustment thus permits the proper gauging of the brush itself with reference to the street surface as well as provides front end support and stability for the machine as a whole. This adjustment further permits compensation of the general operating level of the machine according to brush wear.

It will, of course, be understood that during certain operations the machine will travel with the brush operating in the street gutter and for lateral guidance I provide a curb shoe 46 which is secured by hanger bracket 47 to the right hand end of the cross member 28 as clearly shown in Figs. 1 and 2. This shoe 46 is thus so located that it may run immediately alongside or even in contact with the curb when the brush is operating in proper proximity thereto. It will further be noted in this connection that the brush hood 24 has its lower edges so located that they will clear the curb under all ordinary conditions.

Positioned forwardly of the brush 17 and in the space between the brush hood and the caster wheel assembly is an elongated rectangular receptacle or pan indicated generally at 48. This receptacle has a closed top 49 and forward end 50 but is open at its rear side toward the brush 17 in order to receive materials swept up from the street thereby. This rear open side as designated at 51 and the receptacle is also closed at its ends as indicated at 52. Secured along the upper rear edge of the receptacle is an angle 53 which is hinged by means of a transverse pin 54 to a similar angle 55 extending across the forward, lower edge portion of the brush hood 24. This hinge structure is not, however, directly secured to the hood but is carried thereon by means of arcuate straps 56 for up and down adjustments with reference to the hood. These straps 56 are of the same contour as the hood and adjacent the upper ends they are slidably mounted thereon by means of overhanging clips 57 as best shown in Fig. 7. Preferably the straps are three in number and above the said clips 57 they are cross connected by an angle bar 58 so that all of the straps may be adjusted as a unit. The straps at each end of the assembly are provided with upstanding apertured lugs 59 in which are hooked the lower ends 60 of elongated adjusting screws 61, the upper ends of which pass through apertured brackets 62 secured to the hood. Nut 63 upon these upper ends of the screws thus permit the entire hinge assembly to be adjusted in an arcuate path and in such manner as to independently raise and lower the receptacle as a whole with reference to the brush and hood. The purpose of such adjustment will be presently pointed out and it will also be noted in Fig. 7 that the end straps 56 have two of the apertured lugs 59 so that a wide range of adjustment is possible. Felt strips 64 secured along the upper rear edge of the angle 55 are arranged to bear upon the forward surface of the hood in such manner as to prevent chatter and vibration at this point.

In its normal or working position the receptacle 48 hangs by the hinge structure just described with its open rear side 51 closely adjacent the lower forward quadrant of the brush. In such position the bottom of the receptacle is closed by an irregularly shaped bottom plate 65 which hinges at its rear edge upon a hinge pin 66 extending transversely between the lower rear corners of the receptacle ends 52. The bottom plate 65 itself has ends 67 which pass within the receptacle ends 52 and also has an upwardly turned forward end flange 68. Inasmuch as the bottom plate is so balanced about the hinge pin 66 as to normally swing downwardly at its forward edge the front end 50 of the receptacle is provided with a forwardly turned stop flange 69 upon which the bottom plate may rest so that it will retain accumulated debris in the receptacle. When the receptacle is tilted upwardly for dumping the bottom plate has a swinging action which will presently be described and stop lugs 70 are secured within the receptacle ends 52 to limit such motion. The bottom plate structure is completed by a downwardly and rearwardly angled guide plate or shoe 71 which is mounted by screws or rivets as seen in Fig. 3 and adapted to run immediately and forward of the brush almost if not in actual contact with the street surface.

The lower forward corners of the brush hood 24 are provided with arcuate guide wings 72 secured at 73 which flare outwardly in such manner as to guide loose material into the receptacle

and to accommodate these wings in its normal position the receptacle ends are deeply notched as indicated at 74. For the same purpose of guiding material laterally into the receptacle its lower rear corners are provided with rearwardly flaring wings indicated at 75.

The receptacle 48 is positioned about its hinge structure by hydraulic rams or fluid motors 76 which comprise cylinders 77 pivoted at upper ends 78 between support bars 79. These support bars are secured at lower ends to the angles 55 and extend upwardly and rearwardly therefrom as clearly shown in Figs. 1 and 2. The plungers 80 of the rams 76 angle downwardly and forwardly to points of attachment 81 about midway of the top 49 of the receptacle. It will thus be evident that projection of the plungers 80 downwardly and forwardly will swing the receptacle toward its normal or lower position, whereas retraction of the plungers will swing the receptacle upwardly to its dumping position through substantially a quarter turn as seen in Fig. 3. The weight of the receptacle is so located with reference to the hinge about which it swings that the use of single action fluid motors is made possible with fluid connections 82 for the admission of the fluid through the lower ends of the cylinder in order to lift and swing the receptacle in an upward direction. The receptacles are further provided with forwardly extending nose brackets 83 at transversely operated points and these are provided with contact shoes 84 adapted to bear upon the cross member 28 of the gauge wheel assembly.

The brush 17 is operated by a conventional rotary fluid motor designated at 86 which is secured atop one end of the brush hood 24. This motor has an output shaft 87 located in a housing 88 and provided with a sprocket 89 over which runs a sprocket chain 90. The chain extends downwardly inside the adjacent end 25 of the hood and operates over a sprocket 91 upon the brush hub in such manner that the operation of the motor 86 will rotate the brush in the direction of the arrow in Fig. 1, or in such manner that it moves forwardly upon its lower, street contacting side. The motor 86 is supplied with operating fluid through an intake connection 92 and the fluid after passing through the motor emerges through a return connection indicated at 93. The hydraulic control and supply system for this motor and for the rams 76 will be next described.

Referring now particularly to Fig. 4 the fluid supply is seen to comprise a reservoir 95, atop which is a valve block 96 to which fluid is supplied under pressure from the reservoir from a pump 97 connected at 98 to the block and with an inlet connection 99 to the reservoir. A rock shaft 100 is supported by brackets 101 from the valve block and has an operating connection 102 to a valve 103 which supplies pressure through a connection 104 for operation of the loader or frame assembly B. The details of this portion of the system are of course immaterial to the present invention but as shown in this drawing the rock shaft 100 is operated by a crank 105 and link 106 which is connected to a hand lever 107 pivoted at 108 to a part of the tractor. The rotary fluid motor 86 has its intake connection 92 supplied with fluid through a supply line 109 controlled by a valve 110 forming part of the block 96. For operation of this valve 110 I provide a tubular rock shaft 111 journaled upon the aforesaid shaft 100 and with an operating connection 112 extending to the valve. This rock shaft 111 is also provided with a crank 113 and link 114 for control and hand lever 115 operating about the pivot 108. Both hand levers are, of course, located convenient to the operator's seat upon the tractor and so that the brush 17 may be continuously operated without attention upon the part of the operator its hand lever 115 is provided with mechanism 116 which holds the lever in position for opening the valve 100 and continuously supplying fluid to the motor. Said mechanism 116 comprises an arm 117 secured to the bracket 118 supporting the pivot 108 and a latch 119 pivoted at 120 upon the hand lever 115. When the latch 119 is engaged with the arm 117 as shown it obviously holds the hand lever in position for opening valve 110 but the operator may at any time release the latch in order to close the valve and halt the operation of the sweeper brush.

The return connection 93 of the brush motor 86 is connected by a return line 121 to a fitting 122 to normally return used fluid to the reservoir 95. However, a valve 123 is arranged in this return line 121 in order to pinch off its connection to the reservoir and this valve is controlled from the operator's station by means of a shaft 124 provided with a universal joint connection 125 to the valve and with a hand wheel 126 at its rear end convenient to the hand of the operator. As seen in Fig. 2 the fluid supply connections 82 to the rams 76 operating the receptacle 48 are connected by flexible conduits 127 and are tapped into the intake line 92—109 adjacent the motor 86 as indicated by the fitting 128. Thus at any time that operation of the ram 76 is desired in order to pull up the receptacle 48 to dumping position, the operator by manipulating the hand wheel 126 may close off the valve 123 and the fluid flowing to the motor 86 will be diverted in part to the inlet connections 82 of the rams in order to retract the plungers 80 as necessary to this operation of the receptacle. Inasmuch as the sweeper as a whole moves upwardly and downwardly with reference to the tractor it is, of course, necessary to provide flexible conduit or hose connections between the fluid operated elements on the sweeper and the supply and control system upon the tractor. The supply and return condiuts for this purpose are designated at 129 and 130 respectively and in order to keep them out of the way as well as to compensate for the up and down movement just described these flexible elements are trained over a multi-grooved pulley 131 journaled upon an upper corner portion of the loader B as clearly shown in the drawing. This system of operation of the rams 76 by pinching off the return from the fluid motor 86 to divert fluid to the rams, thus enables me to operate these three separate fluid devices upon the sweeper by the use of only two of such flexible conduits, resulting in a material simplification of the system as a whole as will be readily appreciated. In order to return seepage fluid from the rams 76 and motor 86 to the reservoir 95 on the tractor I also provide a third flexible conduit 132 having a seepage line connection 133 to the reservoir and connections indicated throughout at 134 to the rams and fluid motor. Such seepage return is, of course, not absolutely necessary but due to the fact that I am enabled to supply and control the rams and motor with only two supply lines, I am still enabled to obtain the benefits of returning seepage fluid to the reservoir with a total of only three lines also as will be understood.

In the operation of the machine it will, of course, be understood thatt he caster wheels will

be adjusted so that they properly contact the street surface when the loader B is lowered, while the receptacle will be independently adjusted by the screws 61 to bring it into proper relation with the surface and the brush. Thus, as the brush rotates in the direction described it will cast all accumulated debris into the receptacle and periodically the loader B may be elevated in such manner as to bring the sweeper to an elevation sufficient to permit it to be placed over an ordinary dump or transport truck such as indicated at G in Fig. 3. The operator then actuates the rams 76 to swing the receptacle 42 forwardly and upwardly so that its open side 51 is turned downward to dump the accumulated material into the truck. As the receptacle approaches such dumping position the bottom plate 65 is thrown over center with reference to the axis of the hinge pin 66 and the plate then swings downwardly and rearwardly against the stops 70 also as shown in Fig. 3. As this occurs any material which may cling to the bottom plate 65 is jarred loose so that it will fall into the truck and if necessary the operator may, by intermittent operation of the rams 76, swing the receptacle 48 several times to dumping position and the repeated jarring contact of the bottom plate 65 as described will clear it of all material as will be evident. Preferably I provide a spray pipe 135 across the lower forward edge of the hood 24 and supply it with water so that materials swept up by the brush will be dampened to hold down dust. Even so, the jarring action of the receptacle and its bottom plate 65 will thoroughly clean out the damp material.

As the brush wears, the overall level of the machine may, of course, be adjusted by positioning the caster wheels 26 as has been described and inasmuch as the links 30 and 31 have a parallel motion such adjustments may be made without affecting the front to rear level of the machine. The independent adjustment of the receptacle 48 permits it to be properly positioned with reference to the brush and all of these adjustments provide such flexibility that the brush may be worn completely out before it is necessary to discard it and replace it with a new one. It will thus be apparent that I have provided a machine of an extremely practical construction and one which permits the operation of street sweeping to be carried out without the use of shovel or foot labor and, of course, much more rapidly than possible with present day methods.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described my invention, what I claim to be new and desire to protect by Letters Patent is:

1. In a street sweeper of the character described, a frame, a rotary brush on the frame, a fluid motor for rotating the brush, a tiltable receptacle for receiving debris swept up by the brush, a fluid operated ram for tilting the receptacle, a source of fluid under pressure including a pump and a reservoir, a supply line from said source to the motor, a return line from the motor to the reservoir, a line connecting

said supply line to the ram, and means for pinching off said return line to divert fluid to the ram for operation thereof.

2. In a street sweeper of the character described, a frame, a rotary brush, means rotatably supporting the brush from the frame, a receptacle for debris swept up by the brush, means tiltably supporting the receptacle on the frame, a rotary fluid motor connected to rotate the brush, at least one fluid operated ram connected to tilt the receptacle, a source of fluid under pressure for operating the motor and ram and including a pump and a reservoir, an intake connection from said source to the fluid motor, a return connection from the motor to the reservoir, a supply connection to the ram tapped into the intake connection of the motor, a valve for controlling fluid flow to the motor, and a valve in the return line from the motor to reduce the flow of return fluid and divert fluid to the ram.

3. A pick-up and dump street sweeper, comprising a frame adapted for travel movement over the street, a rotary brush journaled on the frame, means for rotating the brush forwardly at its underside to sweep up debris from the street, a receptacle of generally rectangular shape positioned forwardly of the brush and having an opening facing the brush to receive and accumulate debris swept up thereby, hinge means connecting the upper rear portion of the receptacle to the frame, means for tilting the receptacle to dump accumulated debris through said opening, a pair of caster wheels arranged forwardly of the receptacle, a cross member connecting the wheels, means adjustably connecting the wheels to the frame, and means on said receptacle for supportably engaging said cross member in the normal position of the receptacle.

4. A pick-up and dump street sweeper, comprising a frame adapted for travel movement over the street, a rotary brush journaled on the frame, means for rotating the brush forwardly at its underside to sweep up debris from the street, a receptacle of generally rectangular shape positioned forwardly of the brush and having an opening facing the brush to receive and accumulate debris swept up thereby, hinge means connecting the upper rear portion of the receptacle to the frame, means for tilting the receptacle to dump accumulated debris through said opening, a pair of caster wheels arranged forwardly of the receptacle, a cross member connecting the wheels, means adjustably connecting the wheels to the frame, and a member projecting forwardly from the receptacle and overlying the said cross member to supportably engage the same in the normal position of the receptacle.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
525,815	Mueller	Sept. 11, 1894
720,474	Pike	Feb. 10, 1903
2,194,297	Drumm	Mar. 19, 1940
2,268,059	Parker et al.	Dec. 30, 1941
2,286,245	Wilson et al.	June 16, 1942
2,402,299	Schield	June 18, 1946
2,631,314	Fitzpatrick	Mar. 17, 1953