Jan. 8, 1963 LE GRAND H. LULL 3,071,793

STREET MAINTENANCE EQUIPMENT

Filed May 4, 1959 7 Sheets-Sheet 1

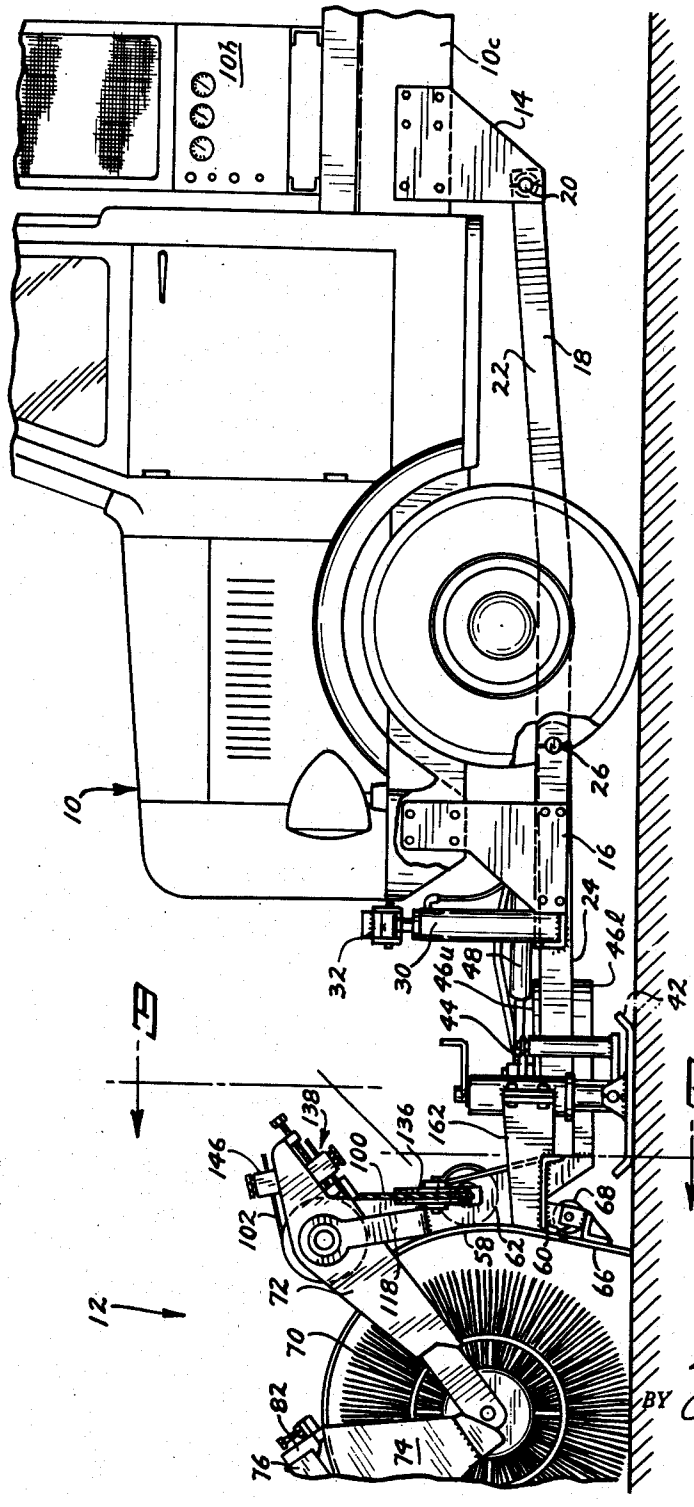


FIG. 1

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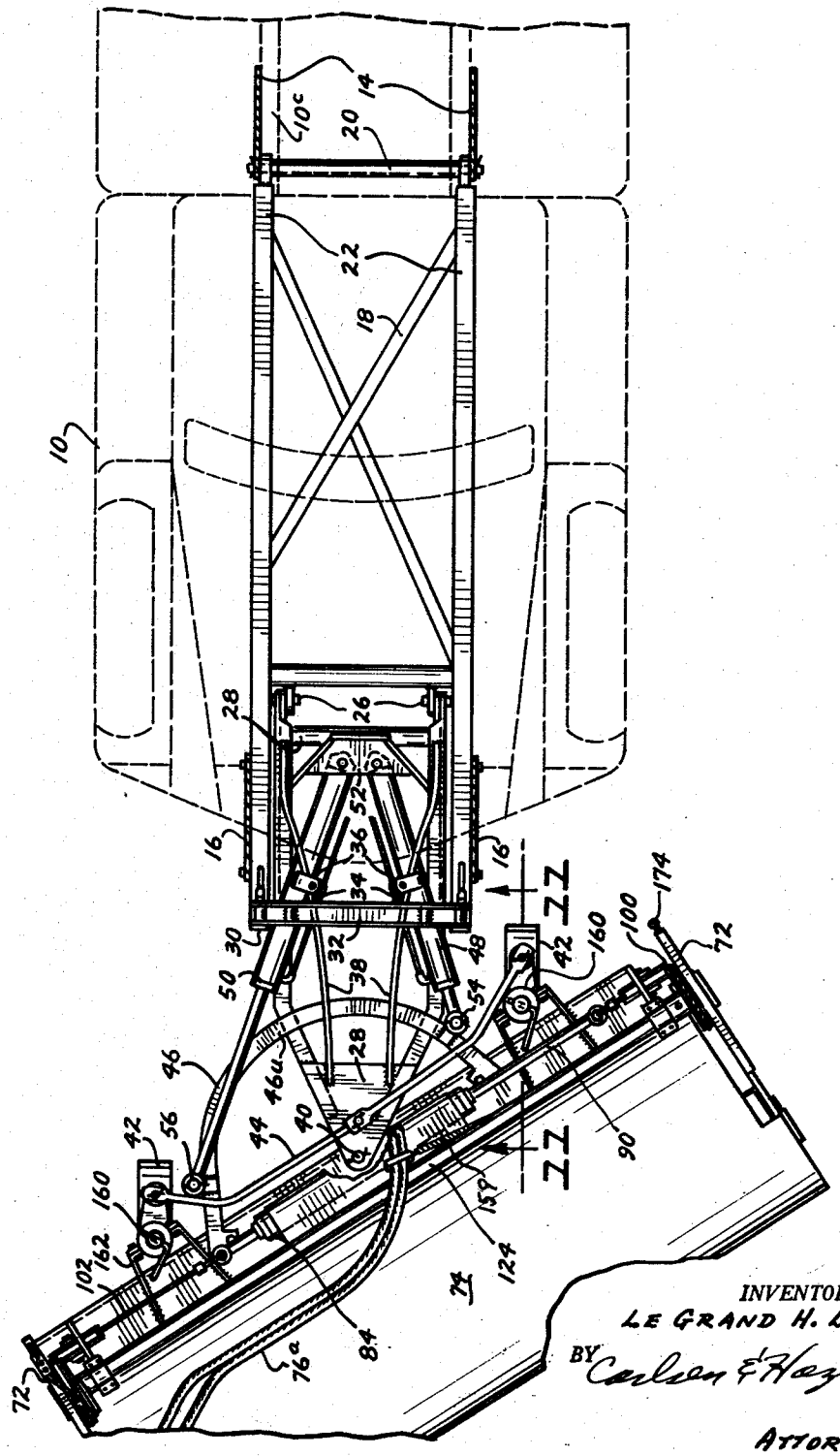
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STREET MAINTENANCE EQUIPMENT

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FIG. 2



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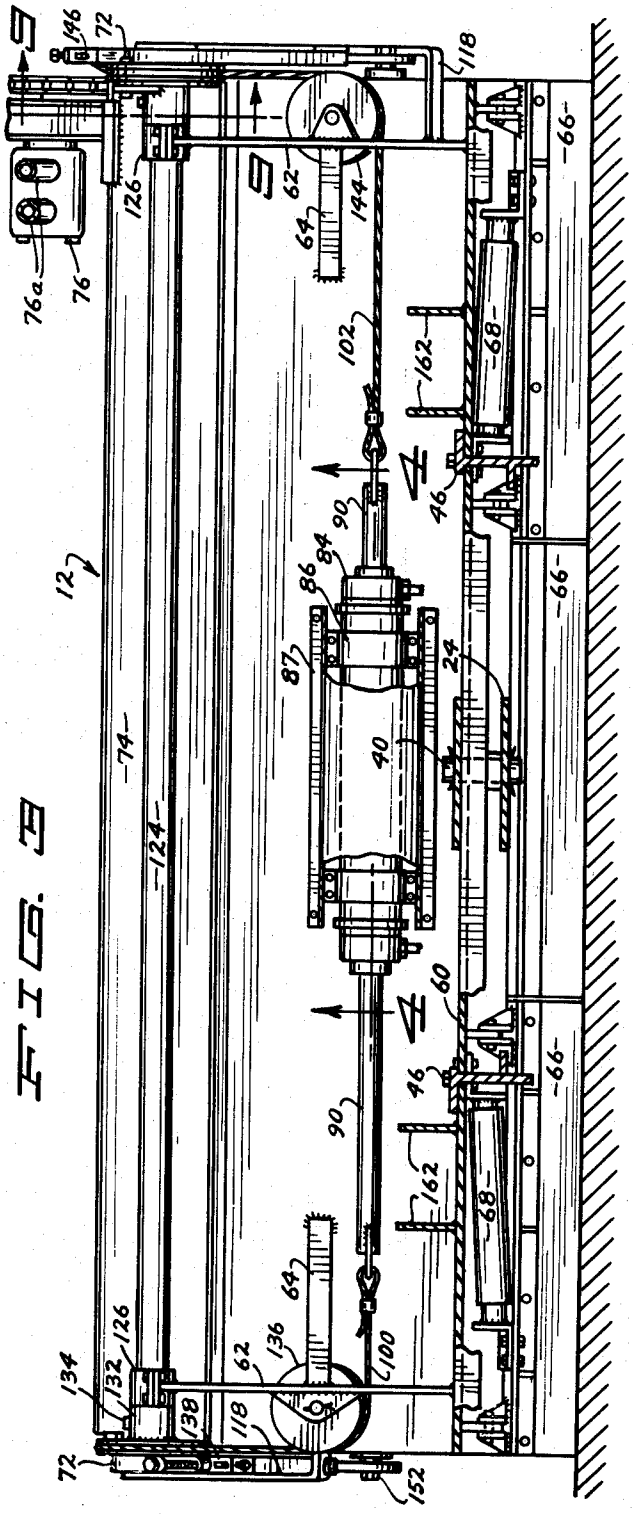


FIG. 3

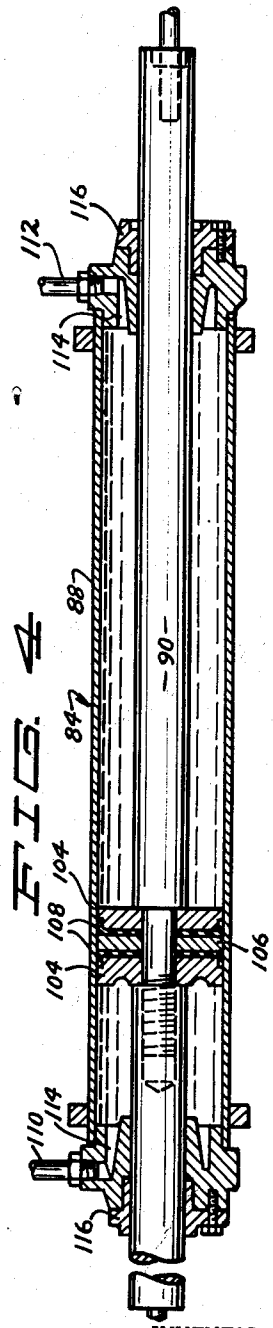


FIG. 4

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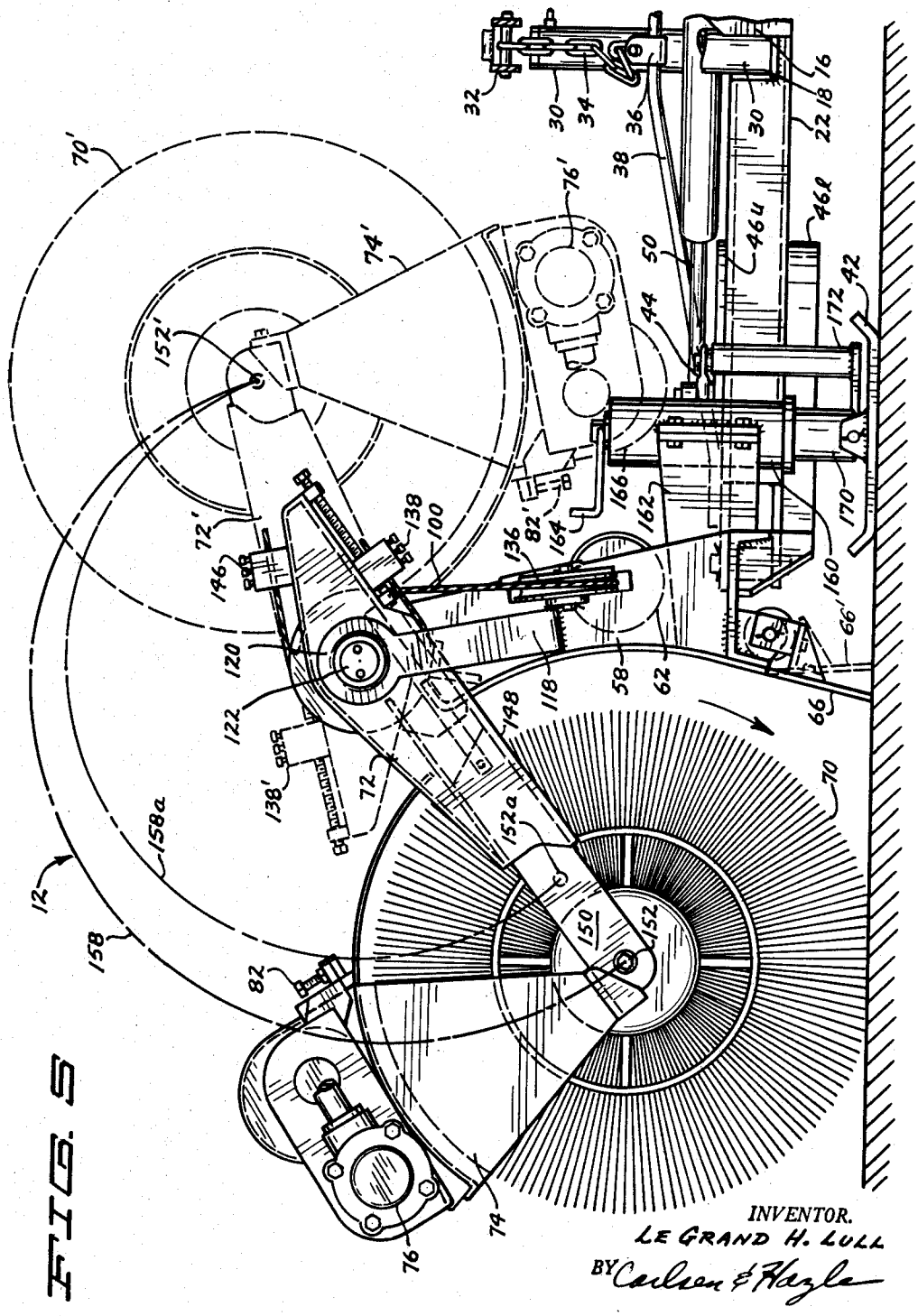


FIG. 5

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FIG. 6

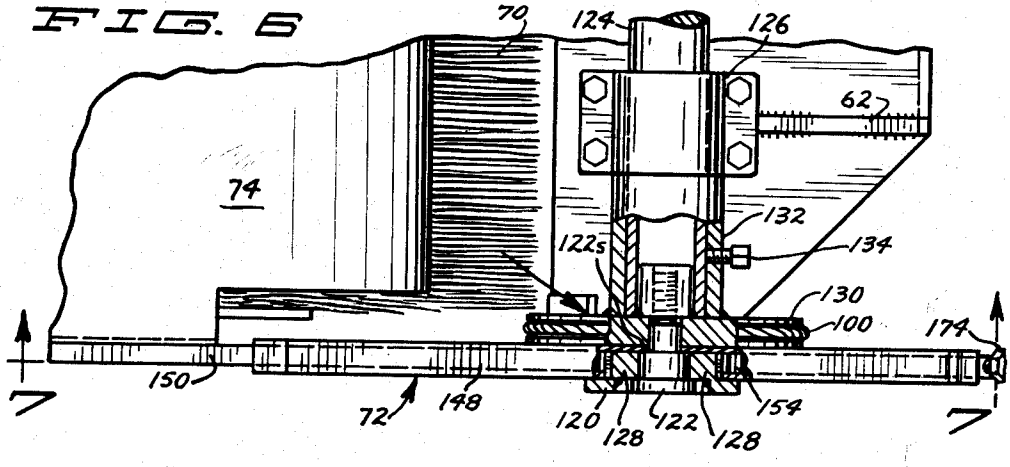
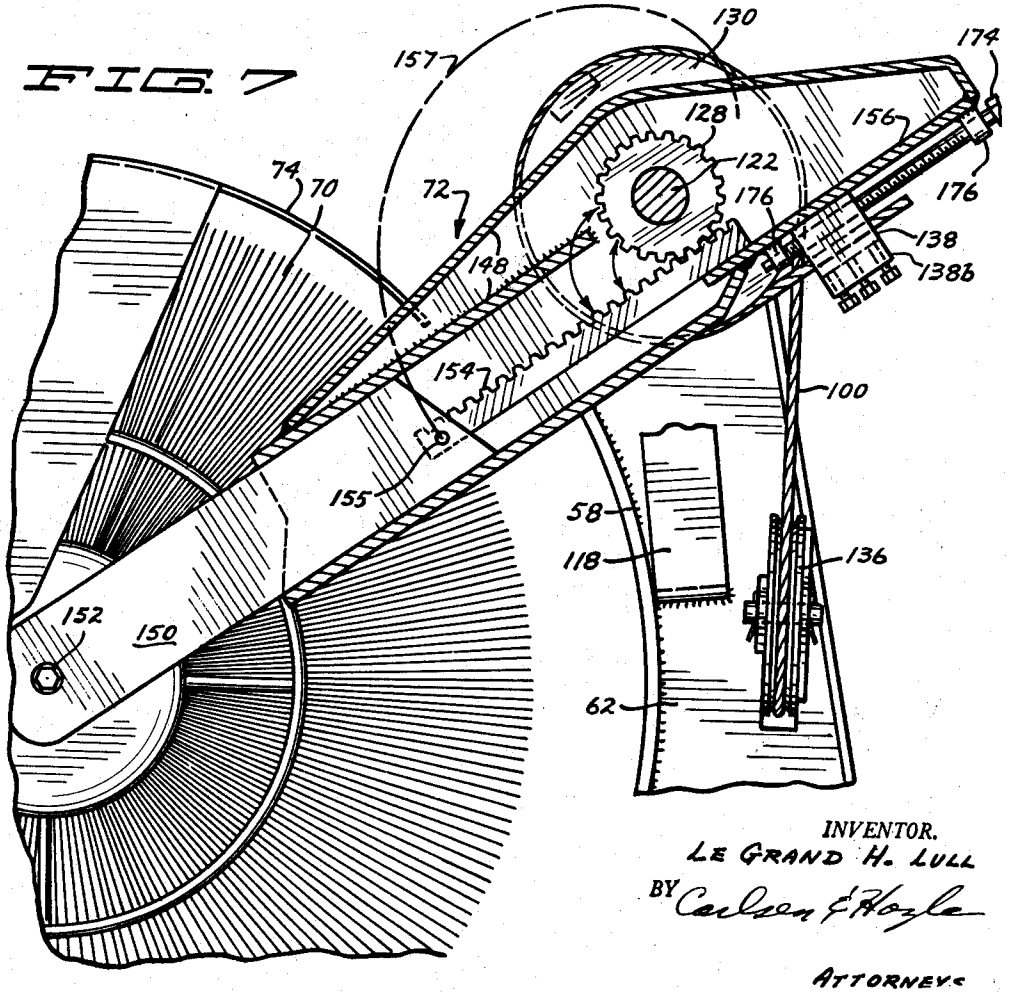


FIG. 7



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FIG. 8

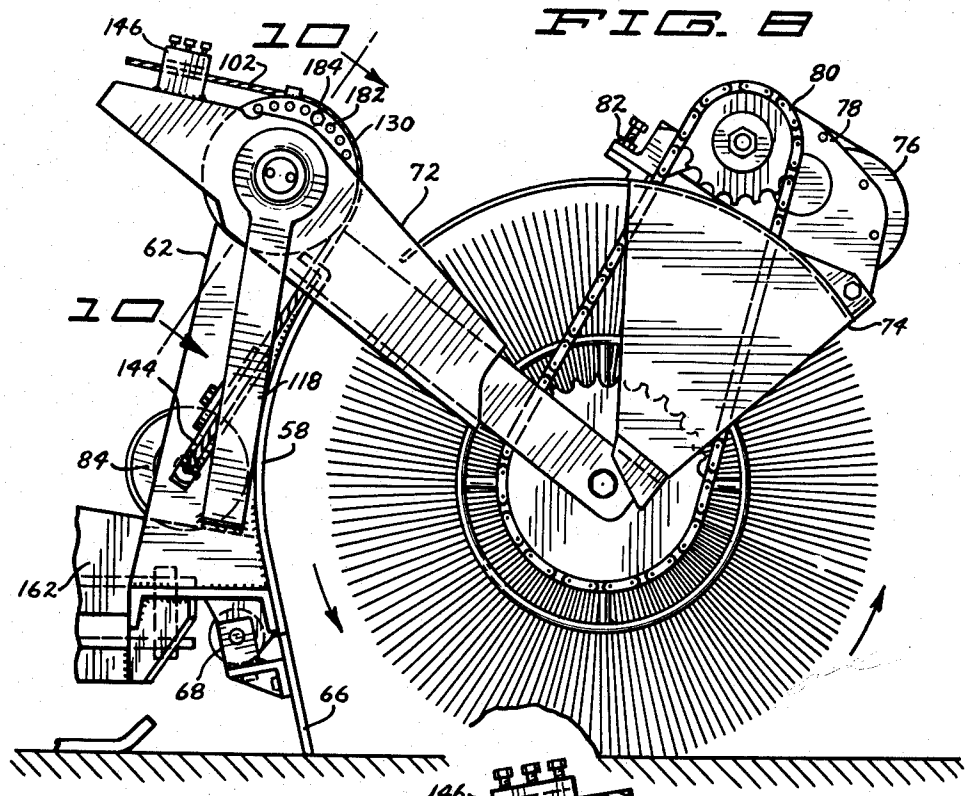


FIG. 9

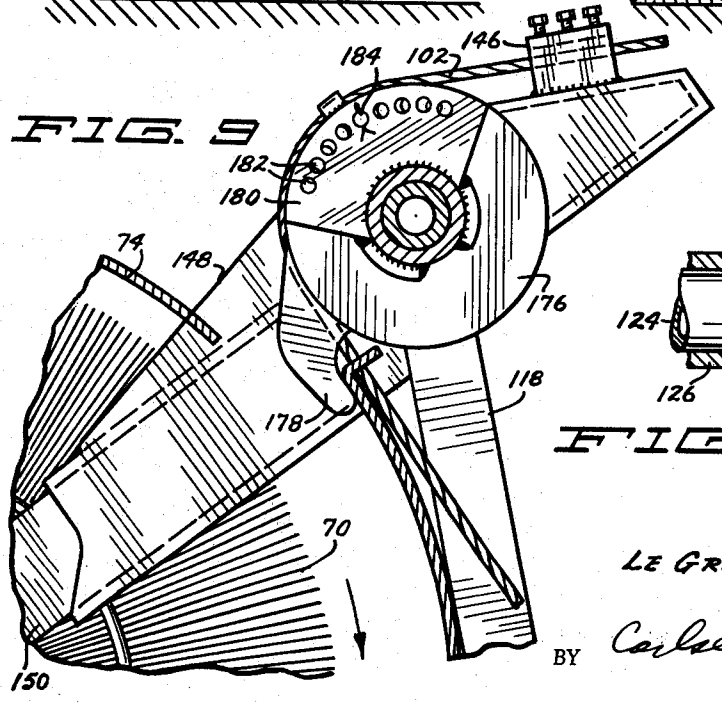
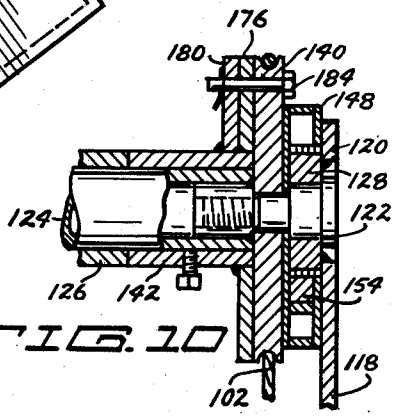


FIG. 10



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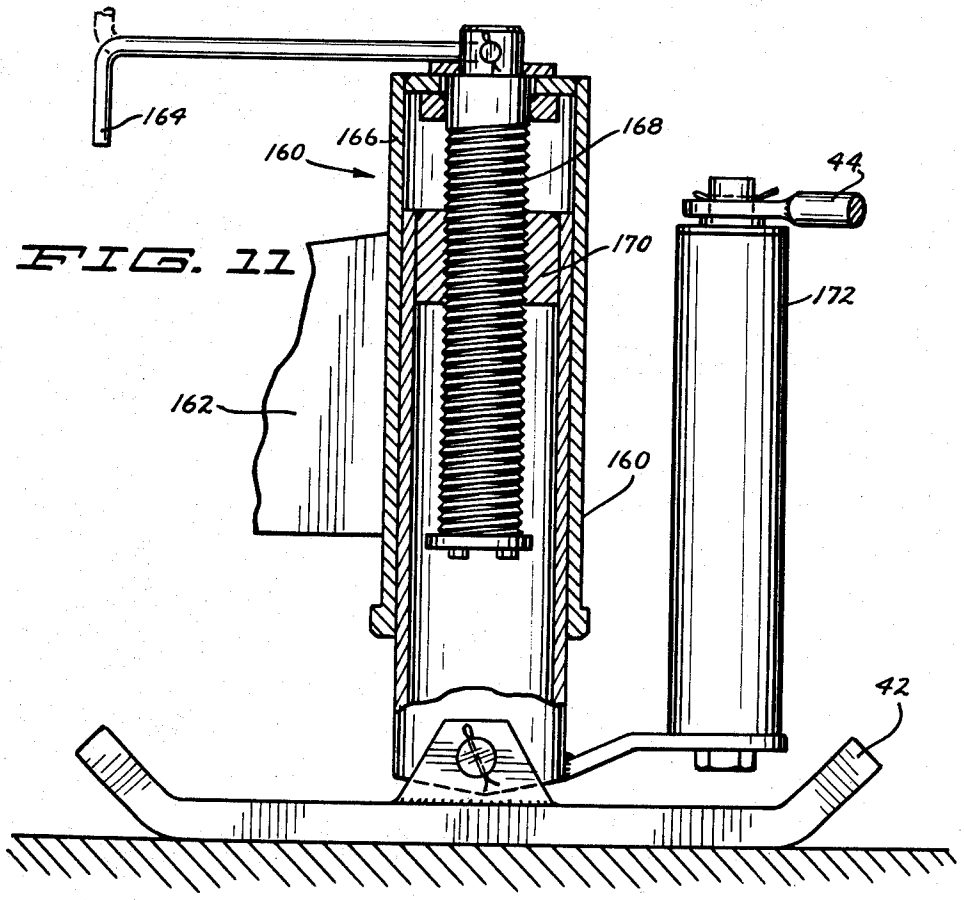


FIG. 11

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United States Patent Office

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3,071,793

STREET MAINTENANCE EQUIPMENT

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Filed May 4, 1959, Ser. No. 810,726

9 Claims. (Cl. 15—82)

This invention relates to street or runway cleaning and maintaining apparatus and especially to improvements therein providing for mounting of two cleaning devices on a single frame.

Rotary type broom street sweepers as well as blade type of snow plows have been used for a number of years. When a single cleaning device, such as a rotary broom, is mounted on a carrying vehicle the utility of same is limited in the northern climates to the warmer part of the year. Making the device on a separate detachable frame to be mounted on a truck provides for increased utility of the truck, however, presents several limitations in that during the spring and fall months there are times when alternate days will permit either sweeping or require snow plowing. Therefore, maximum utility of the truck for street cleaning purposes is not achieved even with the detachable cleaning device especially since attachment and detachment often requires several man hours.

Therefore it is an object of this invention to provide street cleaning or maintaining equipment having two cleaning devices mounted thereon with one of the devices pivotable over the other device between an operative position and a non-operative, transport position.

It is a further object of this invention to provide in street cleaning or maintaining equipment a rotary broom and snow plow combination wherein the broom is pivotably mounted on the plow frame (rearward of the plow blade) and is pivotable between an operative position in front of the blade and a non-operative position rearward of blade.

It is a still further object of this invention to provide street cleaning or maintaining equipment having a snow plow and a rotary broom mounted on extensible arms pivotably supported thereon such that the arm extension is a function of the pivoted position thereof with respect to the plow blade for minimizing the distance between the supporting vehicle and the plow blade.

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 partial side elevational view of the left hand side of an exemplary embodiment of this invention with a rotary broom in operative position forward of the plow blade.

FIG. 2 is a partial plan and sectional view of the FIG. 1 apparatus with the blade and broom angled for street cleaning operations.

FIG. 3 is a view taken along lines **3—3** of FIG. 1 showing the rearward side of the plow blade.

FIG. 4 is a sectional view of the broom positioning reciprocating hydraulic cylinder taken along lines **4—4** of FIG. 3.

FIG. 5 is a partial side elevational closeup view of the FIG. 1 apparatus showing the non-operative position of the broom in dashed outline.

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FIG. 6 is a partial plan and cutaway view of the left hand broom supporting extension arm assembly mounted on the pivot shaft.

FIG. 7 is a vertical partial sectional view of the left hand extension arm assembly taken along lines **7—7** in FIG. 6.

FIG. 8 is a side elevational closeup view of the right hand side of the broom and blade in the FIG. 1 apparatus.

FIG. 9 is a view taken along lines **9—9** of FIG. 3 and showing the right hand extension arm and broom operative position adjustment apparatus.

FIG. 10 is a sectional view taken on lines **10—10** of FIG. 8 of the right hand broom supporting extension arm assembly mounted on the pivot shaft.

FIG. 11 is a vertical sectional view of the exemplary screw jack for adjusting the operating height of the FIG. 1 exemplary embodiment.

With reference now to the accompanying drawings like numbers denote like parts and structural features in the various views. With particular attention to FIGS. 1 and 2 there is shown a truck or tractive vehicle **10** having a conventional hydraulic supply system **10^h** to be utilized for actuating all the hydraulic cylinders and the fluid motor hereinafter referred to. Disposed forwardly of and mounted on truck **10** there is street cleaning and maintaining unit designated generally at **12** having two cleaning devices, one of which is pivotable between the illustrated operative position and a non-operative position as will become apparent. The framing supporting the dual cleaning unit on truck **10** will be first described.

Depending from and bolted to vehicle chassis **10^c** at longitudinally spaced positions are two pairs of laterally spaced apart side plates **14** and **16**. Bolted to and extending forwardly and rearwardly of depending front side plates **16** is a rear supporting frame **18** of welded construction and underslung on truck chassis **10^c**. The rear end of frame **18** is supported by rear spacing shaft **20** consisting of a rod extending through a tubular spacer disposed between the rear ends of frame **16** with the rod disposed through aligned apertures in both the rear end portions of longitudinally extending side I-beams **22** of frame **18** and both of the rear side plates **14**. Shaft **20** is laterally secured at both ends by heavy duty cotter keys which are inserted through small apertures in the shaft ends. So constructed, frame **18** forms a stationary and rigid support on truck **10** for supporting the unit **12** as will now be described.

Intermediate unit **12** and frame **18** is welded channel steel hoist frame **24** adapted to vertically pivot on pins **26** of frame **22**. The side channel members of frame **24** are bent at the forward end to form an apex **28** for permitting angling of unit **12** as seen in FIG. 2. When transporting the equipment unit **12** and hoist frame **24** are in a raised position keeping the cleaning devices off the ground by extending a pair of laterally spaced apart hydraulic cylinders **30** mounted on the forwardmost end of support frame **18**. Disposed laterally across the tops of cylinders **30** and immediately in front of truck **10** is a lift bar **32** having a pair of depending lift chains **34** (FIG. 5) each with a hoist clevis **36** attached to one of a pair of hoist rods **38** welded to hoist frame **24**. In operative positions cylinders **30** are retracted until chains **34** are slack thereby permitting unit **12** and frame **24** to freely pivot on pins **26** to ensure continuous street cleaning

action by unit 12 as the whole equipment traverses uneven terrain.

Street cleaning unit 12 is horizontally-pivotally mounted on apex 28 of hoist frame 22 by a vertical pin 40 held in place by a pair of cotter keys as best seen in FIG. 3. Laterally spaced apart runners 42 provide sliding ground support to cleaning unit 12 maintaining it at a predetermined height from the ground to be cleaned as will become apparent. Tie-rods 44 pivotally connected to apex 28 rearwardly of pin 40 keep runners 42 aligned in the direction of vehicular movement regardless of the unit 12 angle of operation. Additional longitudinal and lateral stability of cleaning unit 12 in any angled operative position is provided by swing circle 46 having vertically spaced apart semi-circular tracks 46^u and 46^l respectively slidably engaging the upper and lower surfaces of frame 24 just rearwardly of apex 28 as best seen in FIGS. 1, 2 and 5. Swing circle 46 welded to unit 12 plus the pivot pin 40 connection with apex 28 make hoist frame 24 and cleaning unit 12 a vertically rigid unit for pivoting about pins 24 as heretofore described.

The horizontal angle of operation of unit 12 is controlled by hydraulic cylinders 48 and 50. As seen in FIG. 2 with cylinder 50 extended and 48 retracted unit 12 is angled toward the left. Cylinders 48 and 50 are both rearwardly supported by reaction plate 52 welded to a rear cross piece of frame 24 and have their respective forward ram ends pivotally supported by pins 54 and 56 at the lateral outer ends of upper swing circle 46^u.

The snow plow portion of unit 12 is best seen in FIGS. 3 and 5 where a snow plow blade having an upper portion 58 is welded to laterally extending downwardly opening channel shaped plow frame 60 having a pair of welded laterally spaced vertically extending brace members 62. It is understood that other types of blades or surface maintaining devices may be substituted for the snow plow blade. For additional rigidity of members 62 angled stabilizing members 64 are welded between the rearward edge of supports 62 and points on blade portion 58 intermediate said members. Just below portion 58 are three hardened steel replaceable blading edges 66 pivotally connected to the under side of plow frame 60 and urged forwardly by torsional springs 68 (FIG. 3) to the position shown in FIG. 5 and pivotable rearwardly upon hitting an obstruction (not shown) to a position indicated by 66'. Each of the three blading edges 66 are independently pivotable and each has its own torsional spring 68, the center spring not being shown.

Forwardly of the snow plow blade there is shown in FIGS. 1, 2 and 5–9 a rotary sweeper including the usual rotary broom 70 rotatably mounted between the outer ends of extension arm assemblies 72 the operation of which will be later explained. Rigidly attached to the outer end of arms 72 is broom shield 74 for keeping the debris from flying upwardly as broom 70 is rotated in the direction of the arrow in FIG. 5 by fluid motor 76 mounted on said shield. Motor 76 is operated by the hydraulic system via flexible hydraulic lines 76^a connected to a conventional hydraulic system 10^h. Motor 76 drives a gear reduction system in housing 78 which drives broom 70 through chain linkage 80. The tension of chain linkage 80 is provided by screw adjustment 82.

With reference now to FIGS. 3 and 4 there is shown an exemplary broom positioning hydraulic cylinder 84 attached to the rear side of upper blade portion 58 by cylinder clamps 86 and protected from the elements by cylinder shield 87. Cylinder 84 is of the double acting reciprocating type wherein there is an outer tube 88 with piston rods 90 axially movable therein having cables 100 and 102 respectively connected to opposite ends thereof for positioning broom 70 as will be later explained. Mounted intermediate the piston rod 90 ends and slidably inserted in tube 88 are a pair of pistons 104 separated by a piston pressure plate 106 and a pair of piston cups 108. Hydraulic fluid under pressure is introduced on either side of pistons 104 respectively through hydraulic lines 110 and 112 connected to annular recesses 114 formed in end seals 116. As will be subsequently described, to move broom 70 upwardly and rearwardly to a non-operative position hydraulic fluid is inserted under pressure through line 110 thereby moving piston rods 90 to the right and thus cables 100 and 102 to the right as seen in FIGS. 3 and 4. To move broom 70 to the FIG. 1 operative position hydraulic fluid under pressure is inserted through line 112 to move cables 100 and 102 to the left.

With more particular reference to FIG. 5 the cable connections and structural features for supporting and pivoting the broom between an operative position shown in solid lines and a non-operative position shown in dashed outline form and indicated by like numbers primed. For example, numeral 70 designates generally the rotary broom as illustrated in the operative position while numeral 70' designates the same broom but in the non-operative position.

Since the left and right hand broom pivot assemblies are substantially identical a description of one will suffice for both, with corresponding parts of each designated by corresponding reference characters. As best seen in FIG. 3 a pair of "L-shaped" auxiliary or outward support arms 118 have their horizontal portions respectively welded to brace members 62 and to upper blade portion 58 while their respective vertical portions extend upwardly in parallel outwardly spaced apart relation to opposing side edges of the blade portion 58.

As best seen in FIGS. 5 and 8 the annularly shaped upper end portions 120 are adapted to loosely receive stepped diameter bolts 122. Bolts 122 extend through several items later described and are screwed into opposite ends of a laterally extending pivot shaft 124 (FIGS. 6 and 10). Shaft 124 forms the pivot axis for and pivots with broom 70 from the operative position shown in FIG. 1 to a non-operative position rearward of blade portion 58. Shaft 124 is pivotally supported in brackets 126 respectively mounted at the upper ends of bracing members 62 through bolts 122 and by stationary pinions 128 solidly welded respectively to the left and right hand annular end portions 120 of outward arms 118. Another function of pinions 128 will be later described.

The left hand pivot construction will now be described with special reference to FIG. 6. A pulley 130 adapted to receive cable 100 has a sleeve 132 welded thereto for extending over the left hand end portion of shaft 124 being held relatively non-rotatable therewith by key and set screw 134. Sleeve 132 provides increased support for the pivot assembly of FIG. 6 when the broom 70 is operated at an angled position such as seen in FIG. 2 wherein there is a reactionary shear force exerted by broom 70 against bolt 122 through arm 72 in the direction of the arrow in FIG. 6. An arm 72 is welded onto pulley 130 to connect arm 72 to shaft 124. With reference to FIG. 7 cable 100 extends from an end of piston rod 90 (FIG. 3) over idler pulley 136 mounted on brace member 62 and laterally stabilized by a member 64 and thence from the frontside rearwardly over pulley 130 to adjustable cable hold clamp 138. Therefore as cable 100 is moved rightwardly as viewed in FIG. 3 arm 72 on the left hand side of unit 12 is urged clockwise through cable clamp 138 thereby pivoting broom 70 upwardly about shaft 124 as will be later more fully described. Note that when the broom 70 center of gravity is forwardly of shaft 124 the weight is exerted only on cable 100.

The right hand pivot assembly as seen in FIGS. 8–10 is constructed similarly to the just described left hand assembly. The other bolt 122 is screwed into the right hand end of pivot shaft 124 and pivotally extending through a like stationary pinion 128. A pulley 140 is welded to an arm 72 and a sleeve 142 which is non-pivotally secured to shaft 124 by a key and set screw.

Cable 102 attached to the right hand end of piston rod 90 (FIG. 3) extends laterally to idler pulley 144 thence upwardly over pulley 140 from the rear side forwardly to a fixed cable clamp or holder 146. Now as fluid cylinder 84 is actuated to urge cable 102 to the left the right hand arm 72 is rotated clockwise when looking toward the right hand view or counterclockwise when looking toward the left side as seen in FIG. 1. Thus cable 102 urges broom 70 on arms 72 downwardly, it being understood as cylinder 84 moves to the left, cable 100 is moved a like distance to permit the left hand arm 72 to rotate in a like manner. It is remembered that pivot shaft 124 is non-pivotally connected to both extension arms 72 thereby transmitting torsional force between said arms to lift or lower opposite ends of broom 70 in a like manner.

As seen in FIG. 5 the pivot axis represented by bolt-shaft 122—124 is rearwardly of the snow blade portion 58. In this view the dashed outlines indicate the non-operative position of rotary broom 70 and its supporting structure and it is seen that the portion of extension arm 72 in the non-operative position as indicated by 72' is well above and out of blocking position of any snow or other material being moved by blade portion 58 so as not to block same and impair efficient operation.

Both arm assemblies 72 are constructed in a symmetrical manner and operate identically therefore only the left hand arm assembly will be described in detail with reference being had to FIGS. 5 and 7. Since it is desired to minimize the distance plow blade 58 is extended in front of truck 10 and it is necessary that rotary broom 70 have ample clearance in front of blade 58 when operating, arm assemblies are constructed to extend broom 70 outwardly when in the operative position and to retract broom 70 radially inwardly when in the non-operative position. Each arm 72 is constructed of an inner hollow arm 148 which is welded to the pulley on the respective pivot assembly, the left hand inner arm 148 being welded to pulley 130. Outer extensible arm 150 rotatably supports broom 70 at 152 and is slideably disposed in inner arm 148. At the radial inward end of arm 150 there is pivotally mounted a toothed rack 154 adapted to slide on inner surface 156 of arm 148 and gearingly engage fixed pinion 128. As arm assembly 72 is rotated clockwise as seen in FIG. 7 about pinion 128 rack 154 meshes with the pinion as indicated by the arrows to move the broom rotation axis 152 closer to the pivot shaft 124 in a true spiral motion having a decreasing radius as indicated by dashed line 157 indicative of the laws of movement for pivot 155. Therefore the radial extension of arms 72 is a predetermined function of the angular position of the arms with respect to fixed pinion 128.

The effect of the rack-pinion 154—128 arrangement on broom position is most clearly illustrated in FIG. 5 wherein numeral 158 designates an approximate locus of a spiral type motion for broom rotational axis 152, whereas numeral 158^a designates a true circular path for a point about a pivot axis in shaft 124 for the broom rotational axis in the retracted position 152'. Numeral 152^a indicates the retracted arm position when the broom would be in an operative position; the distance between items 152^a and 152 being the amount of retraction of arms 72 when pivoted from the operative to the non-operative position. The amount of retraction is determined by the effective diameter of pinion 128 and the amount of pivoting of broom-arms 70—72, the greater the pinion effective diameter the greater the retraction.

As seen in FIG. 2 flexible lines 76^a are spring urged toward one side of blade 58. As the broom assembly is pivoted on shaft 124 spring 159 keeps the lines 76^a in a continuously extended position for preventing the lines from kinking or being otherwise damaged during pivoting. Spring 159 also serves to resiliently hold the lines 76^a centrally on unit 12 preventing entanglement of the lines.

In the above described manner the distance between the truck 10 and unit 12 is minimized while the desired operative position of broom 70 well forward of blade 58 is also maintained. In this manner a most compact dual street maintaining unit is provided. An additional advantage of providing a retracting broom assembly is that in the non-operative position as seen in FIG. 5 the shortened radius reduces the torsional forces due to the weight of the sweeping member exerted through members 62 urging the snow plow blade 58—66 forwardly and upwardly.

Adjustment of the unit 12 to provide optimum operation will now be described. Firstly the height above ground of blade edges 66 are adjusted for either snow plowing or for sweeping by adjusting the screw jacks 160. As best seen in FIGS. 1 and 11 both screw jacks have a pair of forwardly extending support plates 162 welded to the upper surface of plow frame 60 and to the rear side of blade portion 58 making the jacks rigid with respect to unit 12. Pivotally mounted on the lower side of each jack is a runner 42 heretofore referred to. An adjustment handle 164 is pivotally connected to each outer jack housing 166 having screw 168 axially supported therein from one end and adapted to be rotated by said handle. Screw 168 is threaded through an aperture in inner housing 170 for adjusting the total jack height by turning handle 164 in the appropriate direction. Rearward of jack 160 is upright tube 172 rigidly attached to the inner housing 170 for connecting the jack to tie-rods 44 to keep runner 42 aligned with the direction of truck movement as heretofore explained.

Next the cables are adjusted in the following manner. Broom 70 is pivoted by cylinder 84 until cable 102 through arm clamp 72 is solely supporting the broom in that particular pivoted position, i.e. the broom 70 center of gravity is rearwardly of the pivot axis of shaft 124. Therefore cable 102 is very taut while cable 100, if improperly adjusted, may have some slack therein. With reference now to FIG. 7 cable 100 is tightened by adjusting cable clamp 138. Screw 174 is turned in spaced apart rotatable screw supports 176 causing the clamp body 138^b to slide on arm 72 axially with respect to the screw. Body 138^b has a threaded aperture (not shown) engaging the threads of screw 174 for providing good mechanical advantage in tightening cable 100 as the drag on the cable by the cable receiveing groove of pulley 130 is quite substantial. Once cable 100 is tightened in the above described manner broom 70 is securely held when in the raised position.

The next and final adjustment is for sweeping operations only and adjusts broom 70 to a desired operating position. In this exemplary embodiment there is provided a dog on one of the arms 72 adapted to engage the blade portion 58 for limiting the forward pivoting of broom 70 and thus determine the operative position thereof. Firstly the apparatus and then the adjustment thereof will be described.

With reference to FIGS. 9 and 10 there is shown a stop disc 176 having radially extending tooth or dog 178 pivotally disposed around sleeve 142 and slidably disposed between pulley 140 and adjustment sector 180. Sector 180 and pulley 140 are welded to sleeve 142 which is non-rotatably secured to pivot shaft 124 by a key and set screw. Sector 180 and pulley 140 each have a plurality of spaced apart apertures 182 adapted to receive pin 184 which may be secured therein by a cotter key. With broom 70 in the operative position dog 178 is resting against the blade upper portion 58 as seen in FIG. 9. As such disc 176 limits the forward pivoting of broom 70. Adjustment of disc 176 is accomplished by pivoting broom 70 to the desired operating position, holding it there by cable 100, removing pin 184, pivoting disc 176 until dog 178 engages blade 58 and reinserting pin 184 through a pair of apertures 182 which are aligned. After the above described adjustment during forward pivoting of broom 70 a slack in cable 102 is indicative that the broom 70 has reached its desired operating position.

Thus there is shown an exemplary apparatus whereby the various objects and advantages of this invention have been successfully achieved. It is understood that suitable modifications may be made in 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. A dual-purpose street cleaner comprising a supporting vehicle, a hoist frame extending forwardly of and being vertically-movably mounted on the forward end of the vehicle, means for moving the frame upwardly, a dual street cleaning unit extending forwardly of and mounted on the hoist frame and having two street cleaning devices, and radially extensible pivotal support means operatively holding one of said devices and being operable to pivot said one device between a radially extended operative position and a radially retracted non-operative position which is intermediate the vehicle and the said other device.

2. In a combination street cleaner, a frame member extending in a general parallel direction with respect to a surface to be worked upon, a sweeping member, a blade member, one of said members being mounted on the frame, a pair of transversely spaced apart braces on said frame extending in a direction away from surface and normal thereto and having upper end pivot means for rotatably supporting the other one of said members, said pivot means including a pinion stationarily associated with the upright braces, a rack associated with said other member and adapted to rotate about the pinion in gear engaging relation, and means in the other member responsive to said rack rotation for moving said other member radially with respect to the pivot means.

3. In a combination street cleaner, a blade mounted on and extending forwardly thereof, said blade having a frame extending rearwardly and generally parallel to a surface to be worked upon and including a pair of laterally spaced apart braces rigidly associated with the frame and extending in a direction away from said surface in an attitude normal to said surface, a pair of extensible arms respectively pivotally mounted on said braces, a rotary sweeper mounted between the arms, means for pivoting the arms for moving the sweeper between an operative position forwardly of the blade and a non-operative position rearwardly of the blade, and means in said arms responsive to said pivoting for radially extending and retracting said arms as the sweeper is moved respectively toward and away from said operative position.

4. In a combination sweeper-maintainer, a blade having a mounting frame therefor, said frame extending rearwardly from said blade and being substantially parallel to a surface to be worked upon when in an operative position, a pair of laterally spaced apart braces rigidly associated with said frame and extending in a direction away from said surface and being substantially normal thereto, a pair of auxiliary support braces respectively mounted on said braces, a pair of extensible arms respectively pivotally mounted between one of said vertical braces and its auxiliary support brace, hydraulic positioning means on the frame, cable means operatively connecting said means with the extensible arms, a rotary sweeper operatively mounted between the extensible arms, the hydraulic means being actuable to move the cables for pivoting the rotary sweeper between an operative position forwardly of the blade and a non-operative position rearwardly of the blade.

5. The subject matter of claim 4 wherein the extensible arms each consist of two telescoping arm members, in each of said arms one of said arm members having a rack attached thereto which is slideable on the other arm member, and a pinion on each of the auxiliary brace members gearingly engaging the rack on the arm adjacent said brace member.

6. In a combination street cleaner, a blade, a frame therefor rigidly mounted thereto and extending in a generally parallel relationship with respect to a surface to be worked upon, first and second braces attached to opposite ends of said frame and extending in a direction away from said surface and being substantially normal thereto, a pair of auxiliary brace members stationarily associated with said frame and respectively having a portion in adjacent spaced parallel relation with said first and second braces, first and second extensible arms respectively pivotally mounted on the first and second braces with the pivotal mount being between the adjacent auxiliary brace member and the brace and having a common pivot axis, a rotary sweeper mounted between the extensible arms, a cable pulley stationarily associated with each arm, hydraulic position means mounted on said frame, a first cable connected to the first extensible arm and extending partially around the first arm pulley generally from front to rear with the cable other end being operatively connected to said means, and a second cable connected to the second extensible arm and extending partially around the second pulley generally from rear to front with the cable other end being operatively connected to said means.

7. Apparatus as in claim 6 further including a pivot shaft extending between and rigidly connecting said arms concentrically with the pivot axis for transferring torque from one arm to the other arm.

8. In a combination street cleaner, a blade, a frame positioned rearwardly of said blade and rigidly attached thereto and extending in a direction generally parallel to a surface to be worked upon, a pair of laterally spaced apart brace means stationarily associated with said frame and extending in a direction away from said surface and substantially normal to said surface, a pair of extensible arms respectively pivotally supported by said pair of brace means in spaced apart parallel and outwardly extending relation, positioning means on said frame, means operatively connecting said positioning means to arms for pivoting same about said brace means, a rotary sweeper supported between the arms at their respective outward ends, the positioning means being operable for pivoting the sweeper over the blade between an operative position forwardly and a non-operative position rearwardly of the blade, and a dog stationarily associated with one of the arms for engaging the blade to limit the forward pivoting of said arms.

9. A dual purpose street cleaner comprising a supporting vehicle, a forwardly extending frame oriented generally parallel to a surface to be worked upon, a blade rigidly mounted thereon and extending forwardly thereof, first and second braces attached to said frame respectively at opposite ends and oriented so as to extend in a direction away from said surface and substantially normal thereto, a pair of auxiliary brace members stationarily associated with said frame and each respectively having a portion in adjacent spaced relation with said first and second braces, first and second extensible arms respectively pivotally mounted on the first and second braces with the pivotal mount between the respective adjacent auxiliary brace member and the brace and having a common pivot axis, a torque shaft non-rotatably connecting the arms, a rotary sweeper mounted between the arms at their respective outward ends, a cable pulley mounted on each arm, a horizontal hydraulic cylinder mounted on the frame rearwardly of the blade and intermediate the braces and having a transversely reciprocating piston rod, a pulley rotatably mounted on each vertical brace, two cables, one of the cables being attached to one end of the piston rod and extending over the rotatable and arm pulleys adjacent the first vertical brace and fixedly attached to the first arm, another one of the cables being attached to the piston rod at its other end and extending over the rotatable end arm pulleys which are adjacent the second vertical brace and being fixedly at-

tached to the second arm, the cables being disposed over the arm pulleys in opposite directions whereby as one of the arms is rotated by a cable the other one of the cables relaxes to permit the other one of the arms to rotate in a like direction, and hoist frame means on the vehicle and operatively connected to the plow frame for supporting same.

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