

Dec. 7, 1971

O. W. KROMER

3,624,853

ROTARY SWEEPER

Filed Nov. 16, 1970

4 Sheets-Sheet 1

FIG. 1

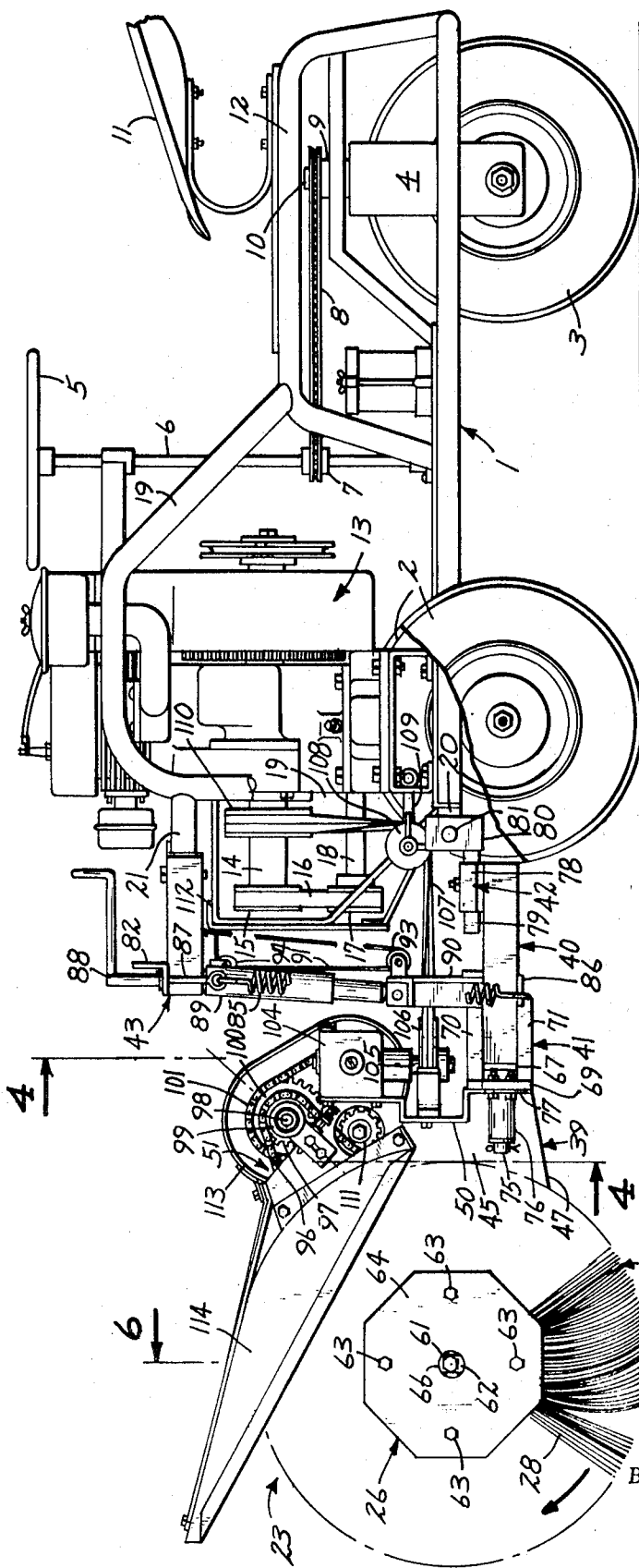
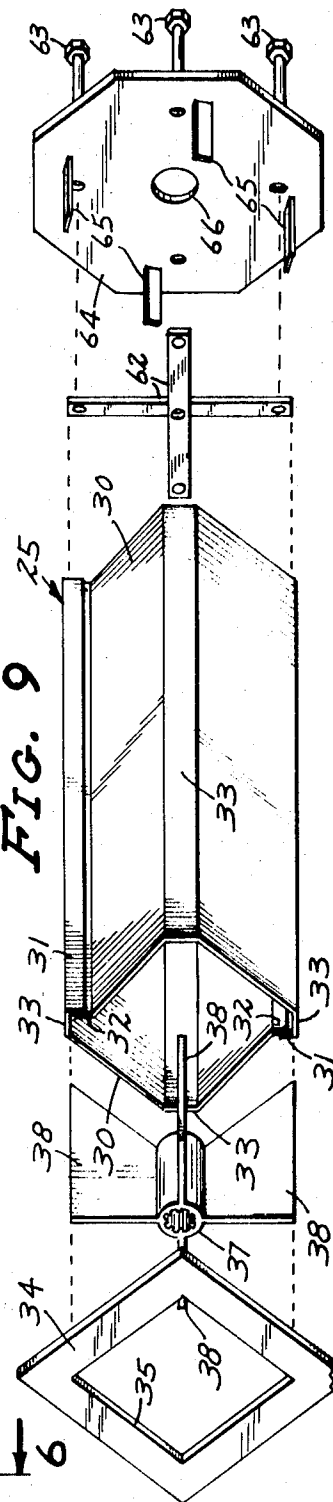


FIG. 9



INVENTOR.
ORLANDO W. KROMER
BY *Merchant & Gould*
ATTORNEYS

Dec. 7, 1971

O. W. KROMER

3,624,853

ROTARY SWEEPER

Filed Nov. 16, 1970

4 Sheets-Sheet 2

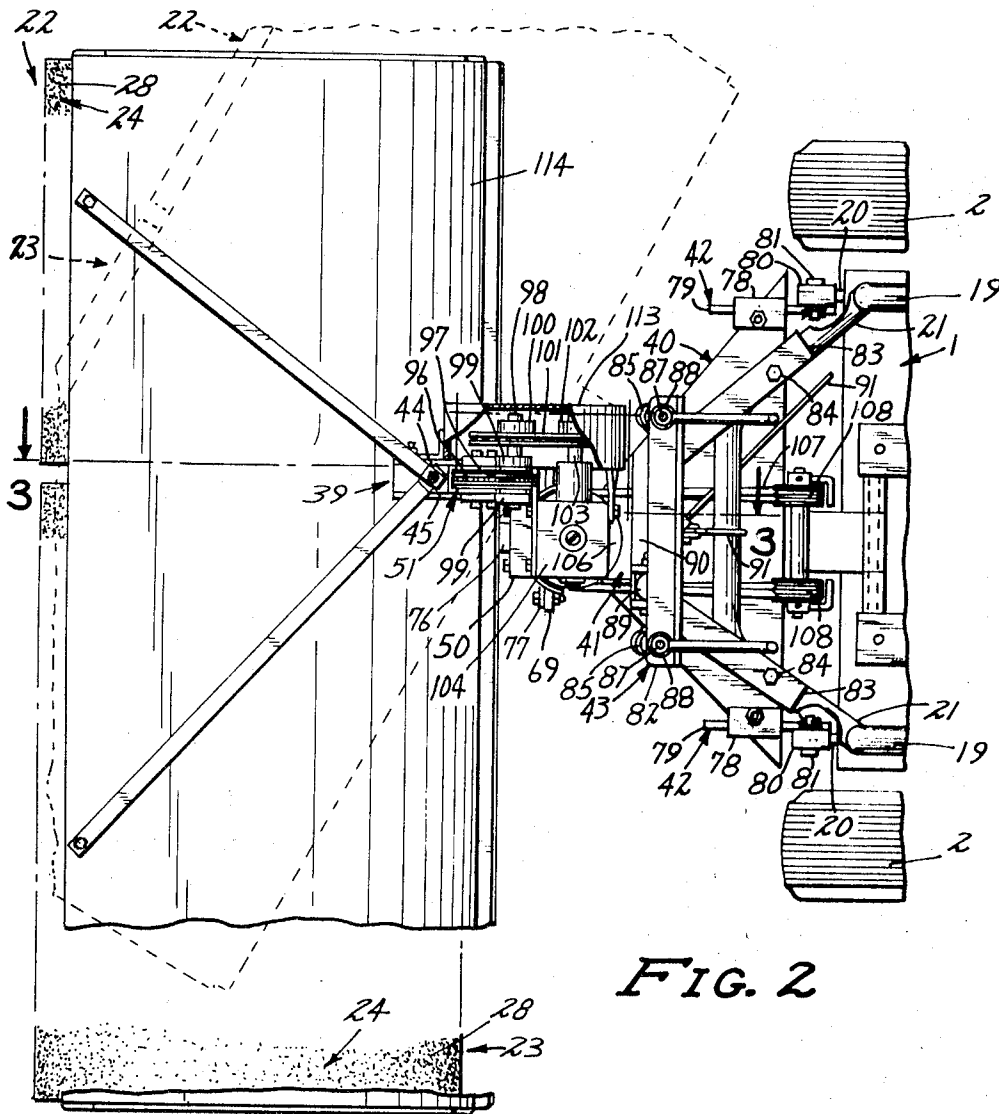


FIG. 2

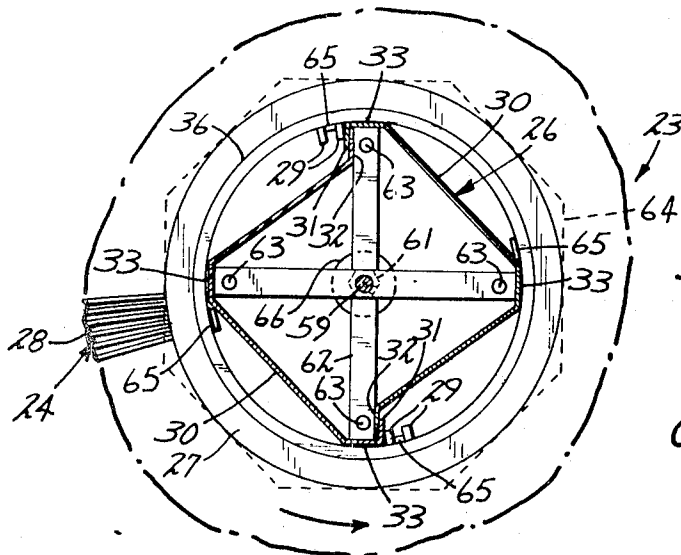


FIG. 8

INVENTOR.
ORLANDO W. KROMER
BY
Merchant & Gould
ATTORNEYS

Dec. 7, 1971

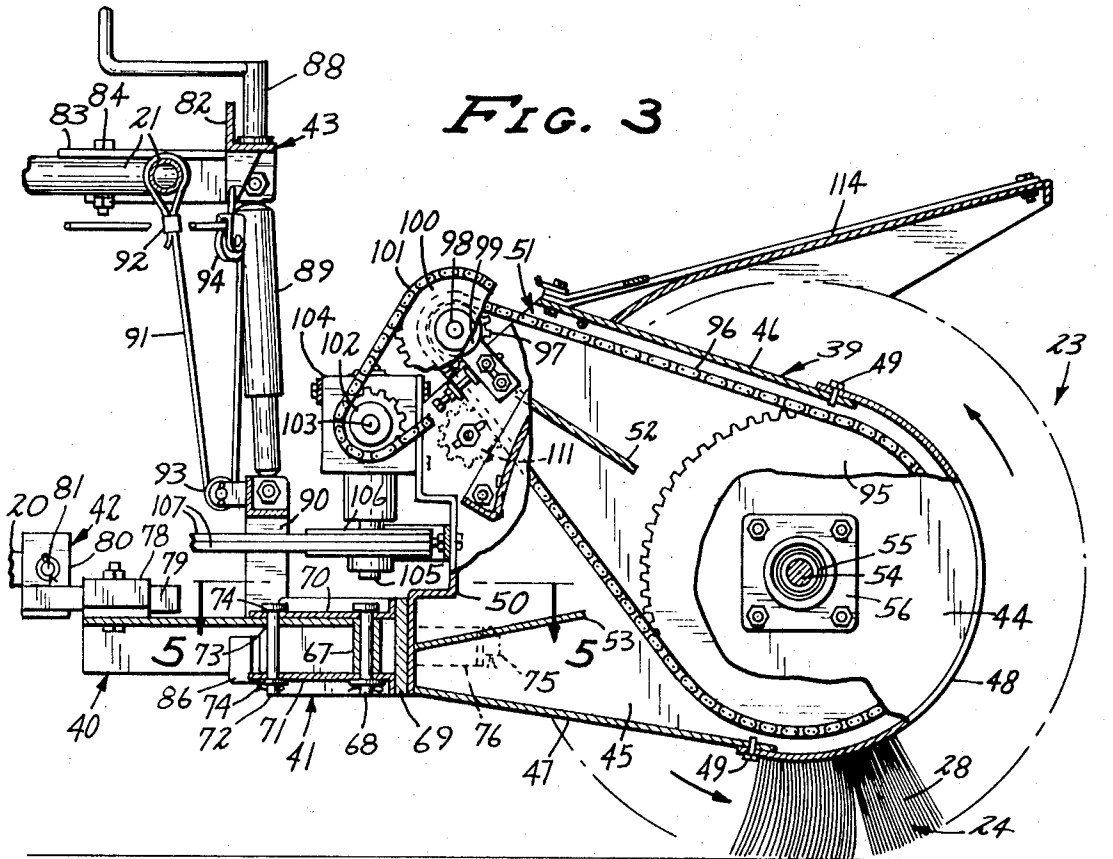
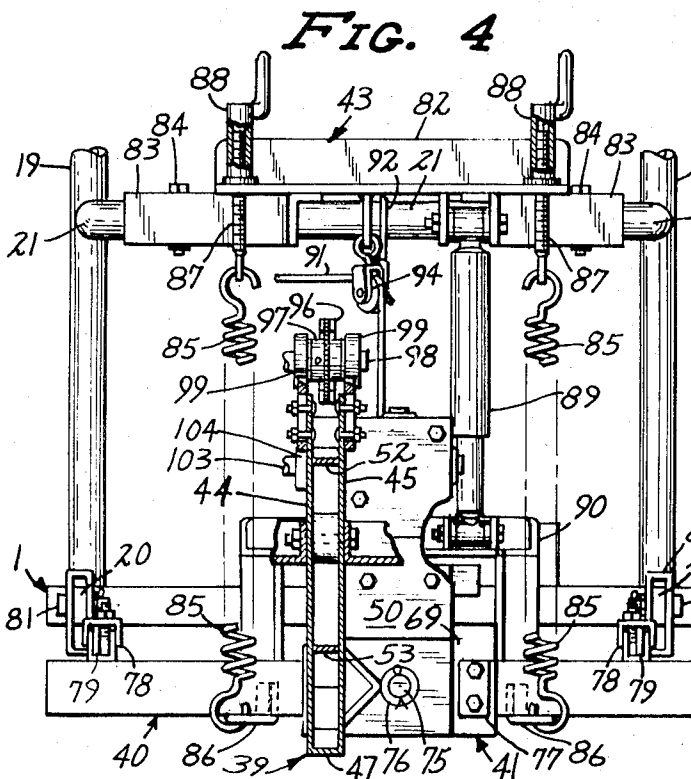
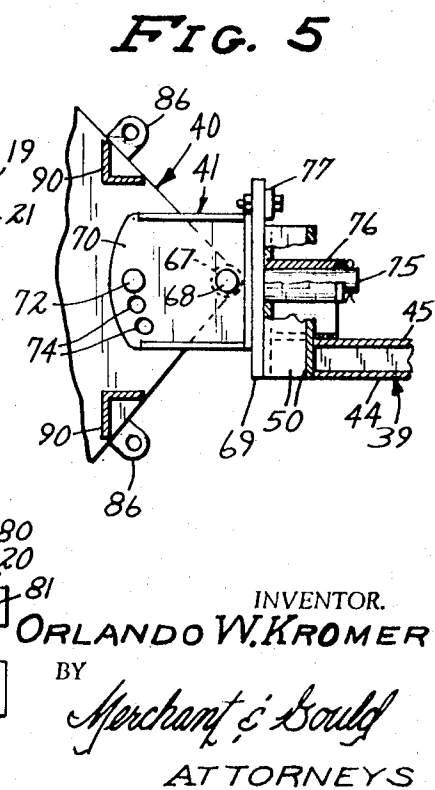
O. W. KROMER

3,624,853

ROTARY SWEEPER

Filed Nov. 16, 1970

4 Sheets-Sheet 3



Dec. 7, 1971

O. W. KROMER

3,624,853

ROTARY SWEEPER

Filed Nov. 16, 1970

4 Sheets-Sheet 4

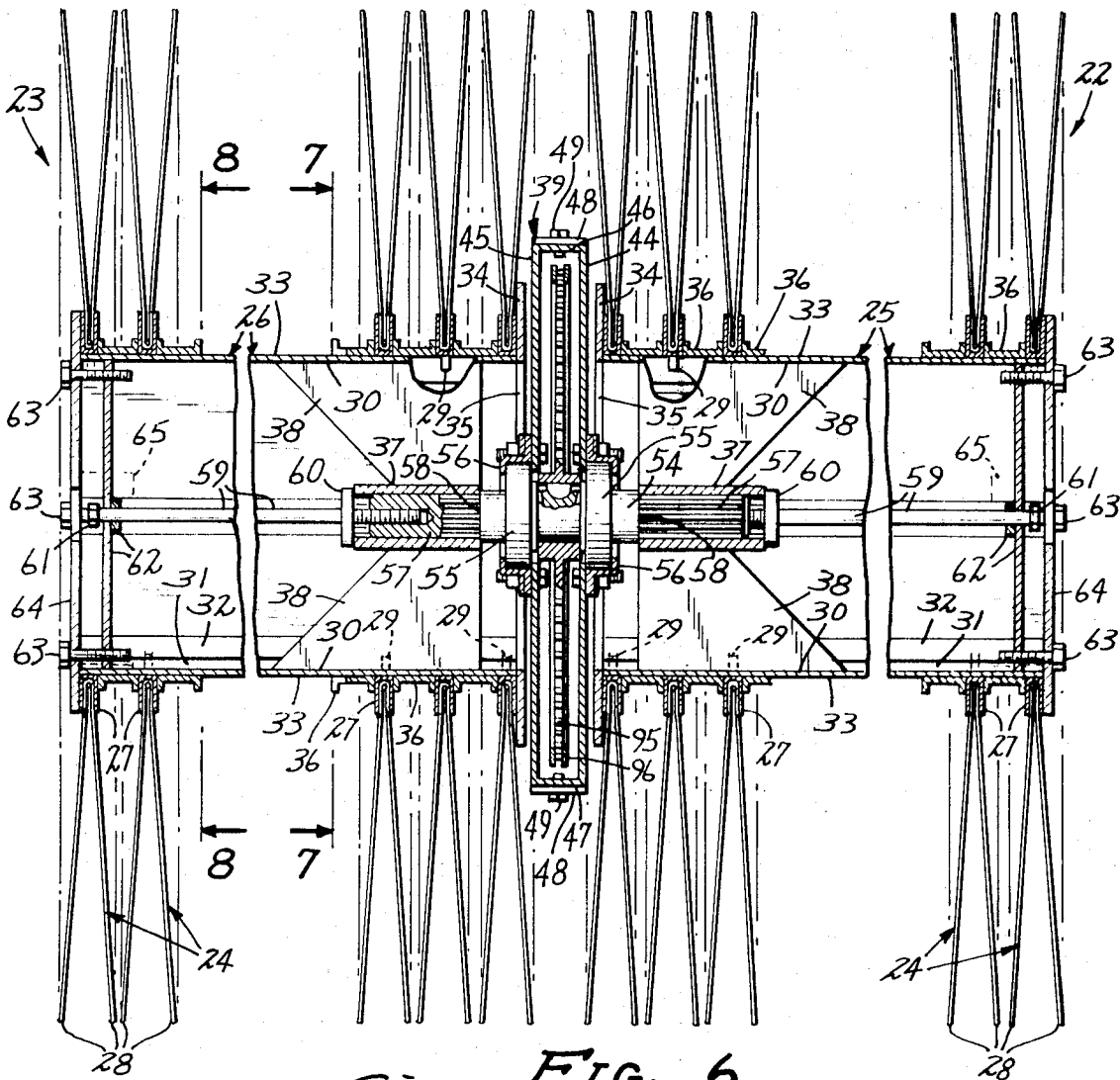


FIG. 6

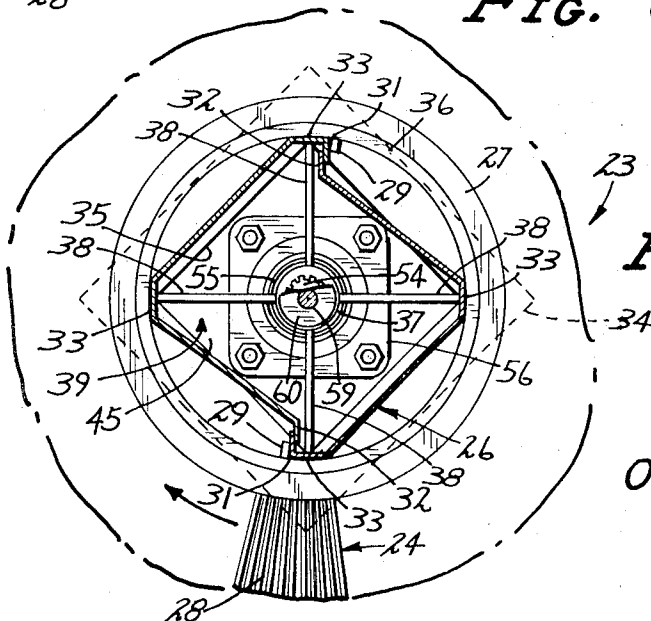


FIG. 7

INVENTOR.
ORLANDO W. KROMER
BY
Merchant & Gould
ATTORNEYS

1

3,624,853

ROTARY SWEEPER

Orlando W. Kromer, Mound, Minn. 55364

Filed Nov. 16, 1970, Ser. No. 89,876

Int. Cl. E01h 1/02

U.S. Cl. 15—82

8 Claims

ABSTRACT OF THE DISCLOSURE

A pair of axially aligned cylindrical brooms having inner ends each mounted on an opposite end of a rotary shaft for common rotation therewith, and supporting structure and a rotary power transmission element for the shaft disposed between the inner ends of the brooms, the shaft providing the sole support for at least one of the brooms from the supporting structure, whereby the outer end of at least one of the brooms is unobstructed.

BACKGROUND OF THE INVENTION

Rotary sweepers are well known, these having bristles or brushes disposed radially in a cylindrical arrangement and mounted on shafts supported at opposite ends by supporting frames and usually driven by connections at one end of the sweeper broom. While such brooms work well generally, the supporting structures at the ends thereof prevent the brooms from sweeping up to a wall, and an unswept area along a high wall must be thereafter swept by hand or other means to achieve satisfactory results.

SUMMARY OF THE INVENTION

The sweeper of this invention involves a pair of axially aligned generally cylindrical brooms each including an elongated core having inner and outer ends, and a plurality of annular brushes mounted on each core. Supporting structure for the brooms includes a pair of closely spaced parallel plate-like support members disposed between the inner ends of the brooms and normal to the axis of the brooms. The support members journal a rotary shaft having opposite ends each mounting a different one of the brooms and providing the sole support of the brooms from the supporting structure, leaving the outer ends of the brooms unobstructed. The supporting structure further includes a base having means for mounting the same on a vehicle for upward and downward swinging movements on a horizontal axis extending transversely of the direction of travel of the sweeper, and connections mounting the support members on the base for limited pivotal movements on a vertical axis and on a horizontal axis extending longitudinally of the direction of travel. Adjustable counterbalancing means is adapted to be mounted on the vehicle above the base. Transmission mechanism, adapted for connection to a prime mover on the vehicle, includes a transmission element mounted on the shaft between the platelike support members, the construction being such that the spacing between the adjacent inner ends of the cylindrical brooms is held to a minimum.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view in side elevation of a rotary sweeper produced in accordance with this invention and mounted on a vehicle, some parts being broken away;

FIG. 2 is a fragmentary view in top plan, some parts being broken away and some parts being shown in section;

FIG. 3 is an enlarged fragmentary view in section taken on the irregular line 3—3 of FIG. 2 and rotated 180°;

FIG. 4 is an enlarged fragmentary section taken on the line 4—4 of FIG. 1;

FIG. 5 is a fragmentary view partly in plan and partly in section taken substantially on the line 5—5 of FIG. 3;

2

FIG. 6 is an enlarged axial section taken on the line 6—6 of FIG. 1, some parts being broken away and some parts being removed;

FIG. 7 is a fragmentary transverse section taken substantially on the line 7—7 of FIG. 6;

FIG. 8 is a fragmentary transverse section taken on the line 8—8 of FIG. 6; and

FIG. 9 is an exploded view in perspective of a core assembly for one of the cylindrical brooms of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawings, and particularly in FIG. 1, a vehicle is shown as comprising a framelike body 1 supported by a pair of laterally spaced tire equipped front wheels 2 and a single rear wheel 3. The rear wheel is journaled in the lower end of a conventional fork 4 that is mounted in the frame 1 for steering movements on a generally vertical axis. A steering wheel 5 is mounted on the upper end of a steering rod 6 journaled in the frame or body 1, the steering rod 6 carrying a sprocket wheel 7 over which is entrained a link chain 8 that is also entrained over a sprocket wheel 9 fixed on a shaft 10 of the fork 4. An operator's seat 11 is mounted on a frame member 12 of the body 1 behind the steering wheel 5 and in overlying relationship to the rear wheel 3. A prime mover in the nature of an internal combustion engine is indicated generally at 13, and is mounted on the front end portion of the body 1. The engine is provided with a drive shaft 14 that projects forwardly from the engine 13 and which has mounted thereon a pulley 15 over which is entrained an endless drive belt 16 which runs over another pulley 17 mounted on a transmission shaft 18. The shaft 18 may be assumed to be operatively connected to the wheels 2 by means of well known and conventional gear transmission mechanism, not shown. The body 1 further includes frame members 19 at opposite sides of the engine 13, and accessory or attachment mounting portions 20 and 21.

The sweeper of this invention comprises a pair of axially aligned cylindrical brooms 22 and 23 and supporting structure including means for mounting the same on the mounting portions 20 and 21 of the vehicle. Each of the brooms 22 and 23 comprises a plurality of annular brushes 24 mounted on respective ones of a pair of elongated axially aligned tubular cores 25 and 26. The annular brushes 24 each comprise an annular mounting ring 27 closely encompassing its respective core 25 or 26, and a plurality of radially outwardly projecting bristles 28. Further, each annular brush 24 includes a driving lug 29 that projects radially inwardly from the mounting ring 27.

It will be appreciated that, except as to axial length, the cores 25 and 26 are identical and, as shown in FIGS. 7-9, the cores are cross-sectionally polygonal, each thereof being made from a pair of identical core elements 30 formed from sheet metal to provide opposite in-turned and out-turned longitudinal flanges 31 and 32 respectively, and generally flat longitudinal corner faces 33 adjacent the flanges 31, and intermediate their opposite side edges. The arrangement is such that the longitudinal faces 33 are spaced apart substantially 90° of circular arc, the in-turned flange 31 of each core element 30 being welded or otherwise rigidly secured to the out-turned flange 32 of its cooperating core element 30. At their inner ends, the core elements 30 are welded or otherwise rigidly secured each to a different one of a pair of flat rectangular members 34, having rectangular openings 35 therein, the members 34 forming peripheral flanges at the inner ends of the cores 25 and 26. As shown in FIG. 6, the innermost ones of the annular brushes 24 are disposed in abut-

3

ting engagement with their respective flange forming members 34, adjacent brushes on each core 25 and 26 being spaced apart by annular spacers 36. Adjacent their inner ends, the core elements 30 are provided with axially disposed tubular hubs 37 having splined interiors and which are mounted in their respective core elements 30 by radial webs 38 that are welded or otherwise rigidly secured to the hubs 37 and the interior surfaces of the core elements 30.

Supporting structure for removably mounting the brooms 22 and 23 on the vehicle body 1 includes a housing 39, a normally horizontally disposed base 40, a connecting member 41 between the housing 39 and base 40, and mounting members 42 and 43 for connecting the base 40 to the attachment mounting portions 20 and 21 respectively. The housing 39 comprises a pair of laterally spaced vertically disposed parallel walls 44 and 45, top and bottom walls 46 and 47 respectively, welded or otherwise rigidly secured to the side walls 44 and 45, a semi-circular front wall 48 secured at its opposite ends to the top and bottom walls 46 and 47 by screws or the like 49, and a rear wall 50 of greater width than the top and bottom walls 46 and 47 and extending upwardly from the bottom 47, terminating at its upper end in downwardly spaced relation to the top wall 46, to define therewith and with the side walls 44 and 45 an opening 51. The rear wall 50 is welded to the rear edges of the side walls 44 and 45, projecting laterally outwardly from the side wall 44, see particularly FIGS. 2 and 5. Interior of the housing 39, the side walls 44 and 45 are braced by platelike cross members 52 and 53 welded thereto, see particularly FIG. 3.

The side walls 44 and 45 are provided with aligned openings through which extends a rotary shaft 54 that is journaled in bearings 55 adjacent each of the side walls 44 and 45 and mounted thereon by means of brackets or the like 56. The shaft 54 has splined opposite end portions 57 each for reception in a different one of the hubs 37. Adjacent the splined end portions 57, the shaft 54 is formed to provide shoulders 58 which engage the inner ends of the hubs 37 to limit axially inward movement of the hubs on the shaft 54. The broom cores 25 and 26 are securely held against axially outward movement on the shaft 54 by a pair of elongated anchoring screws 59 that are screw threaded into threaded axial openings in the opposite ends of the rotary shaft 54, and which are provided with stop collars 60 that engage the outer ends of the hubs 37, see particularly FIG. 6. It will be noted that the screws 59 are of such lengths that the heads thereof, indicated at 61, are disposed a short distance axially inwardly of the outer ends of the core elements 30. A pair of rigid cross shaped spiders 62 are each disposed within a different one of the cores 25 and 26 in closely axially inwardly spaced relation to the outer ends thereof, and welded to the core elements 25 and 26. The spiders 62 are provided with central openings through which the screws 59 extend, and adjacent their radially outer portion, the spiders 62 are provided with screw threaded openings for reception of machine screws or the like 63 that extend through suitable openings in end plates 64 that abut the outer ends of their respective cores 25 and 26 to releasably hold the annular brushes 24 and spacers 36 on their respective cores 25 and 26. It will be appreciated that, although not shown in the drawings, the bristles 28 diverge radially outwardly from their mounting rings 27 so that it is somewhat difficult to hold the axially outermost brushes 24 in place on their respective core elements 30 when fastening the end plates 64 in place. For the purpose of facilitating assembly of the brooms 22 and 23, the end plates 64 are each provided with a plurality of circumferentially spaced axially inwardly projecting fingers 65 which describe circles equal in diameter to circles described by the corner faces 33 of the core elements 25 and 26. When the end plates 64 are applied to their

4

respective cores 25 and 26, the outermost brush 24 and spacer 36 are mounted on the fingers 65 after which the end plates 64 are positioned with the fingers closely adjacent the inturned flanges 31, as shown in FIG. 8. The anchoring screws 63 are then inserted through openings in the end plates 64 and screw threaded into the threaded openings in the spiders 62, the outermost spacers 36 and brushes 24 moving onto the outer end portions of their respective cores 25 and 26.

With the above described arrangement, it will be seen that each of the cylindrical brooms 22 and 23 is supported from the housing 39 by mounting of its hub 37 on its respective shaft end portion 57, and that the outer ends of each broom 22 and 23 is free of any other mounting means or obstructions which may prevent the brooms 22 and 23 from working very close to a vertical wall or the like. The brushes 24 of either broom 22 or 23 may be disassembled from their respective core 25 or 26 by merely removing the corresponding end plate 64. If it is desired to remove an entire broom 22 or 23, it is only necessary to apply a wrench to the corresponding screw head 61 through a central opening 66 in the adjacent end plate 64 and removing the corresponding screw 59 from the rotary shaft 54. The base 40 is generally triangular in outline, a forward corner portion of the base 40 being formed to provide a tubular bearing 67 for reception of a vertically disposed pivot pin 68. The connecting member 41 comprises a vertically disposed platelike body member 69 and a pair of vertically spaced horizontal plates 70 and 71 rigidly secured to and projecting rearwardly from the body member 69. The plates 70 and 71 straddle the bearing 67 and are provided with aligned openings for reception of the pivot pin 68, so that the connecting member 41 is pivotally movable on the vertical axis of the pin 68 with respect to the base 40. A locating pin 72, disposed in spaced parallel relation to the pivot pin 68, is receivable in opening 73 in the base 40 and in selected pairs of aligned openings 74 in the plates 70 and 71 to releasably hold the connecting member 41 in desired positions of angular relationship with respect to the base 40. A pivot shaft 75 projects forwardly from the platelike body member 69 and forms a pivotal mounting for the housing 39, the rear wall 50 of the housing 39 having a bearing boss 76 that is journaled on the shaft 75, see particularly FIGS. 1, 4 and 5. Thus, the housing 39 and brooms 22 and 23 carried thereby, are capable of angular movement relative to the base 40 by means of the pivotal connection afforded by the pivot pin 68, and movable on a generally horizontal axis extending generally longitudinally of the direction of travel of the sweeper by virtue of the pivotal connection afforded by the pivot shaft 75 and bearing 76. Pivotal movement of the housing 39 and parts carried thereby on the axis of the pivot shaft 75 is limited by engagement of an edge portion of the rear wall 50 with a stop lug or plate 77 bolted or otherwise rigidly secured to the body member 69.

The base 40 is provided adjacent its rear edge with a pair of laterally spaced clamping brackets 78 which receive and releasably hold bar portions 79 of the mounting members 42, the mounting members 42 having hinge portions 80 which receive the attachment mounting portions 20 and which are pivotally connected thereto by pintles 81 disposed on a common and generally horizontal axis extending transversely of the direction of travel of the sweeper. The mounting member 43 comprises a generally horizontal bar portion 82 and a pair of rearwardly diverging arm portions 83, each of which is rigidly secured to a different one of the attachment mounting portions 21 by a machine screw or the like 84. The base 40 is normally supported from the mounting member 43 by a pair of counterbalancing coil tension springs 85 that are connected at their lower ends to angle members 86 on the base 40, and at their upper ends to tension adjusting screws 87 that are screw threadedly received in crank

5

equipped nut elements 88 supported by the bar portion 82. Bouncing of the brooms 22 and 23 and parts associated therewith when the machine is moved over rough terrain, is effectively snubbed by a conventional tubular shock absorber 89 connected at its upper end to the bar portion 82 and at its lower end to an inverted generally U-shaped frame 90 mounted on the base 40. A lifting cable 91 is anchored at one end to the attachment mounting portion 21, as indicated at 92, and is entrained over a pair of pulleys 93 and 94 carried by the frame 90 and bar portion 82 respectively, the cable 91 being used to raise the sweeper out of engagement with the ground during transport or idle periods. The cable 91 may be assumed to be connected at its opposite end to any suitable and well known hoisting mechanism such as a winding drum or hoisting lever, not shown.

For the purpose of imparting rotary sweeping movement to the brooms 22 and 23, a power transmission element in the nature of a sprocket wheel 95 is keyed or otherwise rigidly mounted on the shaft 54 between the walls 44 and 45 of the housing 39. An endless link chain 96 is entrained over the sprocket wheel 95 and extends outwardly through the opening 51 in the housing 39, being also entrained over a relatively smaller sprocket wheel 97 mounted fast on a jack shaft 98 that is journaled in bearing brackets 99 adjustably mounted on the side walls 44 and 45 of the housing 39. Also rigidly mounted on the shaft 98 is a sprocket wheel 100 over which is entrained an endless drive chain 101 which has meshing engagement with a driving sprocket wheel 102 that is mounted on the output shaft 103 of a conventional gear transmission mechanism, not shown, but which may be assumed to be contained in a gear box 104 mounted on the rear wall 50 of the housing 39. The transmission mechanism within the gear box 104 includes a vertically disposed input shaft 105 on which is mounted a pulley 106, a pair of endless drive belts 107 are entrained over the pulley 106, a pair of mule pulleys 108 journaled on bracket means 109 on the vehicle frame 1, and a drive pulley 110 on the motor drive shaft 14. It will be noted that the input shaft 105 and the pivot pin 68 are disposed on a common axis, so that a change of angular relationship between the brooms 22 and 23 and the direction of movement of the vehicle does not affect the tension on the belts 107. Further, it will be noted that the axis of the mule pulleys 108 is in such closely spaced relationship to the common axis of the pintles 81 that whatever relative vertical movement occurs between the sweeper and the vehicle during movement over the ground does not materially effect the tension of the belts 107. An idler sprocket wheel 111 is journaled between the housing walls 44 and 45 to maintain the link chain 96 under proper tension at all times.

Preferably, a guard 112 is disposed over the shafts 14 and 18 and parts carried thereby, a guard 113 being disposed to cover the transmission mechanism between the gear box 104 and sprocket wheel 97, and a hood 114 is disposed in overlying relationship with the cylindrical brooms 22 and 23 aids in controlling the direction of movement of dust, snow or other material gathered up by the sweeper. It will be noted that the cylindrical brooms 22 and 23 are disposed to rotate in a direction to sweep material forwardly and upwardly with respect to the direction of movement of the vehicle, or in a clockwise direction with respect to FIG. 1. With reference to FIGS. 7 and 8, it will be seen that the turned flanges 31 of the core elements 30 provide abutment surface portions that engage the driving lugs or pins 29 to positively impart rotation to the brushes on each core 25 and 26. As shown particularly in FIG. 8, the driving lug 29 of the axially outermost one or two annular brushes 24 will be engaged by one of the fingers 65 of an adjacent end plate which, being rigidly secured to the core will effectively drive the brushes engaged thereby.

While I have shown and described a preferred embodi-

6

ment of rotary sweeper, it will be understood that the same is capable of modification without departure of the spirit and scope of the invention, as defined in the claims.

What is claimed is:

1. A rotary sweeper comprising:

- (a) a pair of axially aligned cylindrical brooms each including an axially elongated core having inner and outer ends and a plurality of annular brushes mounted on said core and having generally radial bristles;
- (b) a supporting structure having generally vertically disposed opposite sides;
- (c) a rotary shaft journaled in said supporting structure and having opposite end portions projecting laterally outwardly from said opposite sides of the supporting structure;
- (d) means on the inner ends of said cores for mounting each of said cylindrical brooms on a different one of said shaft end portions for common rotation coaxially therewith, whereby each of said brooms extends axially outwardly from an opposite side of said supporting structure, said shaft providing the sole support for at least one of said brooms from said supporting structure;
- (e) and means including a power transmission element on said shaft between the inner ends of said brooms for imparting rotation to said shaft and brooms.

2. The rotary sweeper defined in claim 1 in which said supporting structure comprises a pair of laterally spaced parallel platelike support members normal to the common axis of said brooms and extending generally transversely of said brooms, said support members defining said sides and having bearings mounted thereon for journaling said rotary shaft, said power transmission element being disposed between said support members.

3. The rotary sweeper defined in claim 2 in which said supporting structure further includes a base having mounting means for mounting the same on one end of a vehicle, and mounting elements connecting said support members to said base for limited pivotal movements relative thereto on a vertical axis and for other limited pivotal movements of the support members on a generally horizontal axis extending longitudinally of the direction of travel of the sweeper.

4. The rotary sweeper defined in claim 3 in which said mounting means includes a hinge element on said base for pivotally mounting the base on a vehicle on a generally horizontal axis extending transversely of the direction of travel of the sweeper.

5. The rotary sweeper defined in claim 4 in which said support structure further includes a support element having means for mounting the same on the vehicle in upwardly spaced relation to said base, characterized by counterbalancing springs connecting the base to said support element, and means for varying the bias applied to said springs to said base in an upward direction of pivotal movement of the base.

6. The rotary sweeper defined in claim 1 in which each of said cores comprises an elongated hollow core element having a plurality of circumferentially spaced axially extending outer surface portions, said annular brushes engaging said outer surface portions, each of said cores further defining abutment surface portions for substantially the axial length of the core, each of said brushes having a radially inwardly projecting lug element engageable with an adjacent abutment portion to be rotated thereby and common with said core element.

7. The rotary sweeper defined in claim 6 in which said inner end of the core element includes a peripheral flange projecting radially outwardly of said outer surface portions and engaging the innermost one of said annular brushes, characterized by annular spacer elements between adjacent ones of said brushes to limit movement of said brushes axially toward each other.

7

8. The rotary sweeper defined in claim 7 characterized by means on the outer end of each broom for releasably locking said brushes on their respective core, comprising an anchoring member secured within said core in axially inwardly spaced relation to the outer end thereof, a clamping plate disposed adjacent the outer end of said core element, and fastening elements releasably secured to said clamping plate to said anchoring member, said clamping plate being of a size to overlap the radially inner portion of the outermost one of said brushes to clamp said brushes and spacer elements between the clamping plate and said peripheral flange.

5

10

8

References Cited

UNITED STATES PATENTS

1,133,653	3/1915	Moller	15—82
1,579,509	4/1926	Brown	15—82
2,548,676	4/1951	Milz et al.	15—82

FOREIGN PATENTS

93,848	10/1962	Denmark	15—82
697,927	9/1953	Great Britain	15—23

EDWARD L. ROBERTS, Primary Examiner