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3,363,274

STREET SWEEPER PICK-UP BROOM AND ELEVATOR SUSPENSION

Filed May 16, 1966

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FIG. 1.

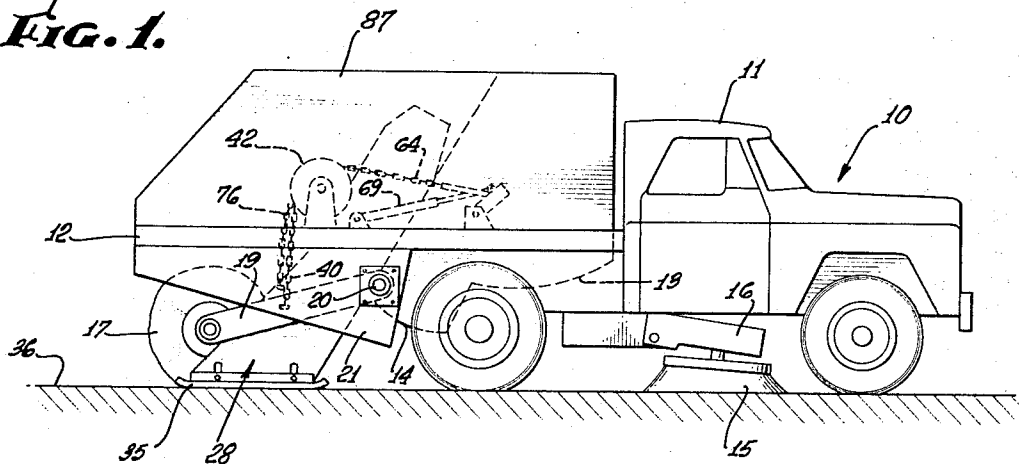


FIG. 2.

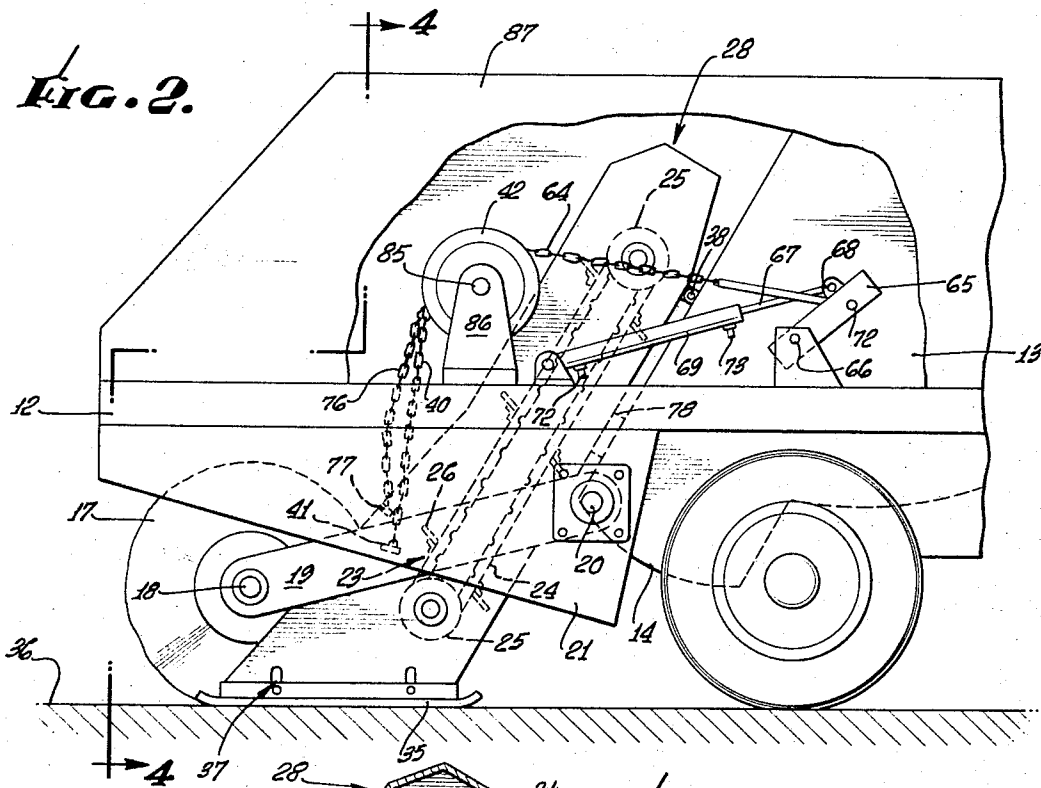
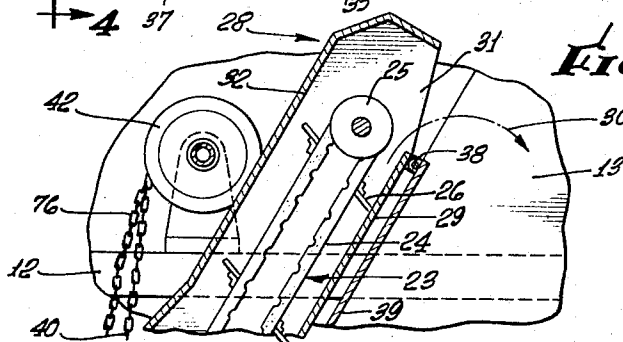


FIG. 3.



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FIG. 4.

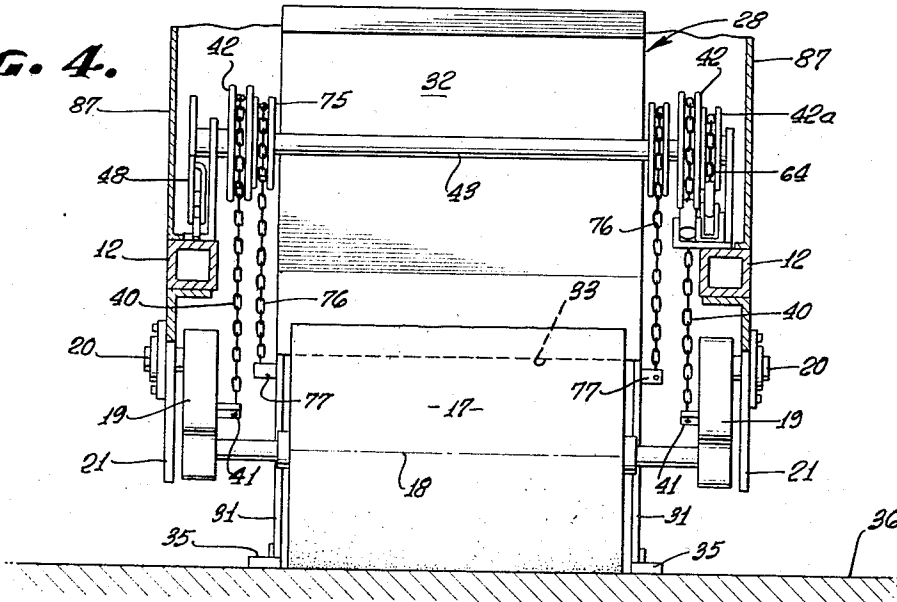


FIG. 5.

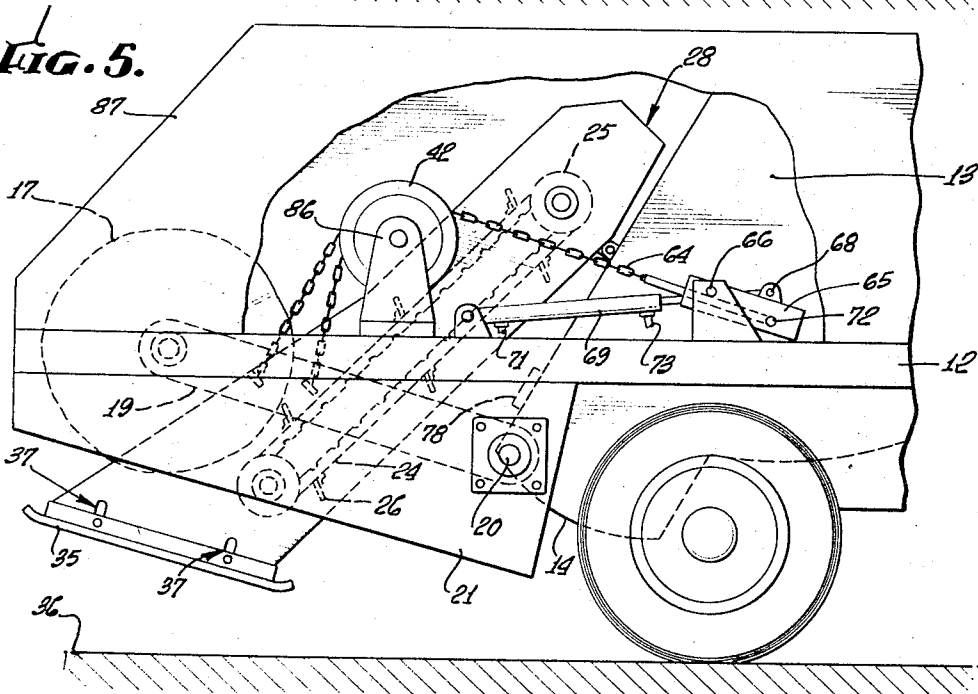
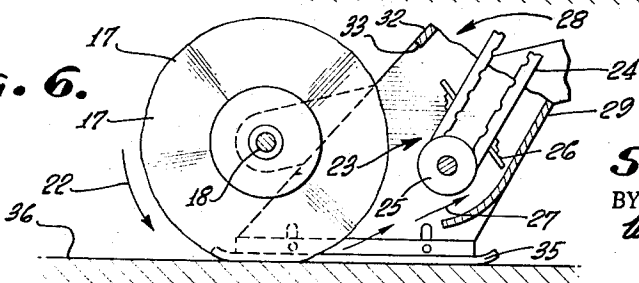


FIG. 6.



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FIG. 8.

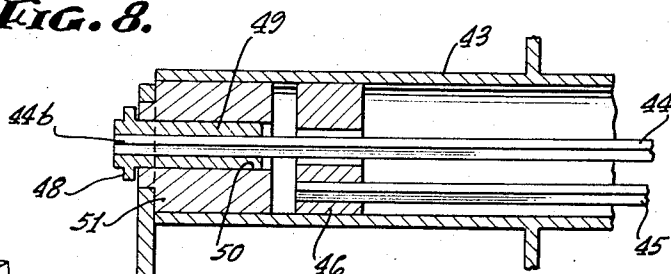


FIG. 7.

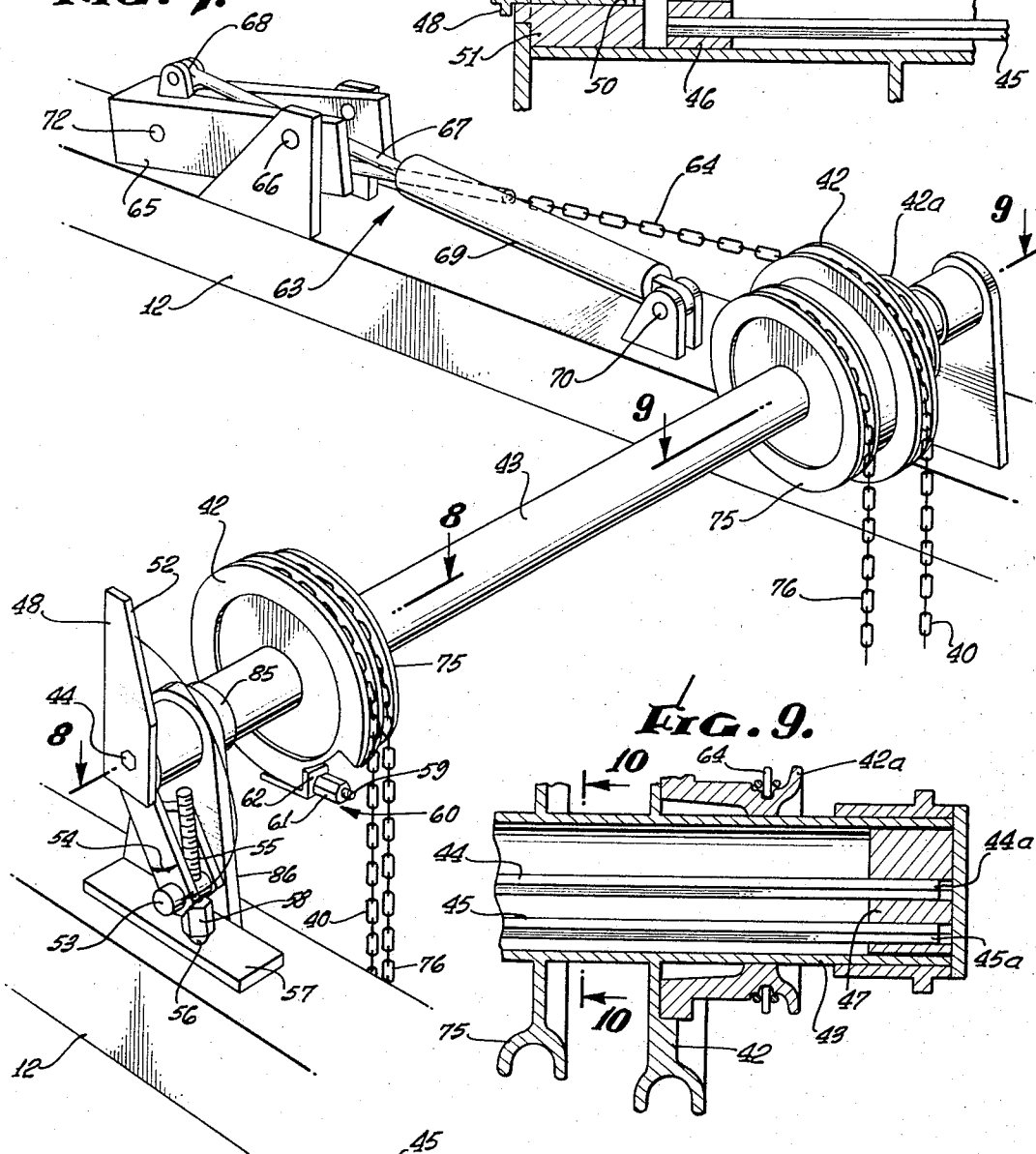


FIG. 9.

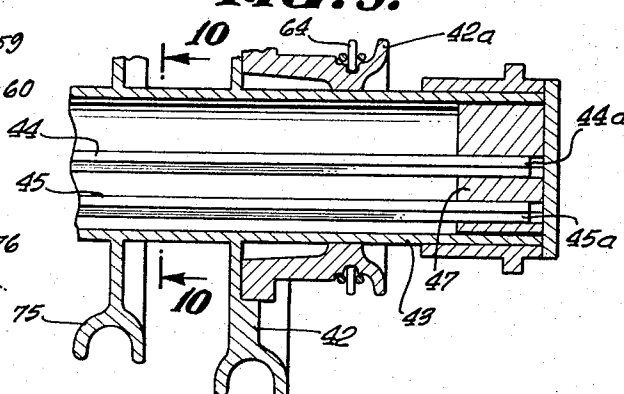
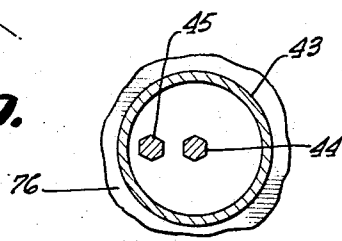


FIG. 10.



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STREET SWEEPER PICK-UP BROOM AND ELEVATOR SUSPENSION

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12 Claims. (Cl. 15—84)

This invention relates generally to street sweepers, and more specifically concerns improvements in suspension systems for trash displacing apparatus such as street sweeper brooms and trash elevators.

It is a major object of the present invention to provide an improved system for lifting a street sweeper broom, and also a trash elevator, and for flexibly supporting the broom in sweeping position. Basically, a single mechanism is provided to combine the functions of lifting the broom and elevator for travel and of adjustably resiliently supporting the broom in sweeping position with low spring rate. Past suspension devices have not, to my knowledge, incorporated these functions in a single mechanism, and as a result have lacked the unusually advantageous features of construction and function as well as the improved results afforded by the present invention.

Basically, the invention contemplates the combination with a street sweeper vehicle of trash displacing apparatus such as a broom or trash elevator, together with means to support and move the apparatus between raised position for travel and lowered position in which the apparatus is operable to displace trash, such means including a torsion bar for transmitting loading imposed by the apparatus accompanied by torsional deflection of the bar providing resilient support for the apparatus in lowered position. Typically, a flexible line such as a chain transmits imposed loading to suspend the apparatus during movement between raised and lowered position, and rotatable tubular structure is provided to wind and unwind that line for raising and lowering the apparatus, the torsion bar being connected to resist rotation of the structure acting to unwind the line. As will be seen, the torsion bar typically has dual or parallel segments enclosed within the tubular structure, to provide a low rate spring suspension for a broom, the latter being raised and lowered by axially spaced portions of the line wound on rotary sheaves, the broom having such support in down position independently of trash elevator apparatus that is subject to raising to travel position with the broom. The low rate spring afforded by accommodation of the torsion bar in the combination has the advantage that the broom is much more free to deflect in response to variations in the contour of the swept surface.

Other features and objects of the invention include the provision of an adjustable device operable to control load resisting torsional deflection of the torsion bar, thereby to control the degree of let down of the rotary broom against a street surface; and the provision of an adjustable device operable through one of the suspension line portions to differentially control tilting of the broom axis relative to horizontal.

These and other objects and advantages of the invention, as well as the details of an illustrative embodiment, will be more fully understood from the following detailed description of the drawings, in which:

FIG. 1 is a side elevation showing incorporation of the invention on a street sweeper vehicle;

FIG. 2 is an enlarged side elevation partly broken away to show details of the invention, the broom and trash elevator apparatus being in lowered position;

FIG. 3 is a fragmentary side elevation showing trash discharge into a vehicle transported dirt box;

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FIG. 4 is a vertical section taken on line 4—4 of FIG. 2;

FIG. 5 is a view like FIG. 2, but with the broom and elevator apparatus in raised or traveling position;

FIG. 6 is a fragmentary side elevation illustrating sweeping of trash into the conveyor or elevator;

FIG. 7 is a perspective showing of the broom and elevator suspension mechanism together with the actuator therefor;

FIG. 8 is a section taken on line 8—8 of FIG. 7;

FIG. 9 is a section taken on line 9—9 of FIG. 7; and

FIG. 10 is a section taken on line 10—10 of FIG. 9.

Referring first to FIGS. 1 and 2, the street sweeper vehicle 10 is shown to include a front cab 11 and a rear frame 12, the latter carrying a dirt box or debris chamber 13. The latter dumps through a bottom reduced outlet indicated at 14, and normally closed by a gate not shown. A gutter broom 15 is shown as suspended beneath the vehicle cab 11 and suitably driven in rotation at 16.

Trash displacing apparatus to be lifted and lowered in accordance with the invention typically includes a rotary broom 17 having a generally horizontal axis 18. Means to support the broom is shown to include arms 19 pivotally connected at 20 to vehicle structure 21. The arms typically include housings containing a drive chain for transmitting drive to rotate the broom in the direction as indicated by the arrow 22 in FIG. 6, the broom being supported at its axially opposite ends by the arms 19. FIGS. 2 and 5 respectively show the lowered and raised positions of the broom.

Trash displacing apparatus also typically includes a trash conveyor mechanism generally indicated at 23. That mechanism includes an endless conveyor 24 such as a belt extending about drums 25, one of which may be suitably driven as by a hydraulic motor in order to transport the conveyor 24 in the loop pattern illustrated, so that the conveyor flights 26 will lift trash and dirt in the direction of the arrow 27, as seen in FIG. 6. In this regard, the conveyor mechanism includes a carriage 28 having an inclined panel 29 adjacent which the conveyor flights 26 move upwardly to lift trash for discharge into the dirt box as indicated by the arrow 30 in FIG. 3. The carriage 28 has suitable side and cover panels 31 and 32 to enclose the movable conveyor mechanism. The cover panel is interrupted to define an opening 33 at the level of the broom 17 so that the broom may extend in said opening and between the side panels 31, as, for example, is seen in FIGS. 4 and 6. Finally, the conveyor carriage has forwardly elongated narrow skids 35 connected therewith at the lowermost portion thereof for engagement with the street surface 36. Tongue and groove connections at 37 between the skids and the side panels 31 of the carriage 28 facilitate height adjustment of the skids relative to the carriage and also relative to the broom. The carriage 28 has pivot connection at 38 with panel structure 39 on the vehicle 10 to allow pivoting of the carriage 28 between the positions seen in FIGS. 2 and 5. As is clear from FIG. 3, panel 39 may define a wall of the dirt box 13.

The invention contemplates the provision of means to support and move trash displacing apparatus between raised position for travel and lowered position in which the apparatus is operable to displace trash, such means including a torsion bar for transmitting loading imposed by the trash displacing apparatus accompanied by torsional deflection of the bar providing resilient support for the apparatus in lowered position. As regards the trash displacing broom 17, such means includes a flexible line typically having axially spaced chain portions 40 connected at 41 to the arms 19, as seen in FIGS. 2, 4 and 5. The support means also typically includes structure such

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as axially spaced sheaves 42 which are rotatable to wind and unwind the chain portions 40 respectively to raise and lower the broom 17 suspended by the cable portions.

The sheaves 42 are typically integral with a horizontally and transversely elongated tubular member 43 so as to rotate therewith, that member receiving a torsion bar connected to resist rotation of the sheaves and tubular member acting to unwind the chain portions 40. As is clear from FIGS. 2 and 7, the cable portions 40 are taut when the broom 17 is in lowered position, so as to suspend at least some of the weight of the broom while allowing the latter to deflect downwardly and upwardly in conformance with torsional constraint imposed by the torsion bar. As seen in FIGS. 8 and 9, the torsion bar has dual segments 44 and 45 enclosed by the tubular member 43 and arranged to provide an extremely low rate spring for the pick-up broom in sweeping position. Torque is transmitted from the member 43 to the bar segment 45 at the attachment location 46, such torque being transmitted along the length of the segment 45 and then transferred at block 47 to the torsion bar segment 44. Block 47 is rigidly attached to the end portions 45a and 44a of the torsion bar segments, and is free to rotate within the tubular member 43. Such transferred torque is then transmitted the length of segment 44 to a torque take-out element in the form of a crank 48 rigidly attached to the end portion 44b of the segment 44. The crank is carried by a bearing 49 journaled within the bore 50 of a bearing sleeve 51 carried by the tubular member 43. The crank 48 has a shoulder 52 engageable with adjustable stop 53 to limit rotation of the torsion bar, the vehicle frame 12 supporting the stop 53.

The invention contemplates the provision of an adjustable device operable to control load resisting torsional deflection of the torsion bar, thereby to control the degree of letdown of the broom against a street surface. That device typically includes a holder part such as the crank 48 integrally rotatable with a section of the torsion bar, as for example end portion 44b thereof, together with a stop part such as stop 53 to limit rotation of the holder part, one of such parts being adjustably shiftable relative to the other. In the example shown in FIG. 7, the stop part is shiftable in the directions indicated by the arrow 54, such shifting being accommodated by the jackscrew 55 pivotally supported against axial motion at 56 to a plate 57 carried by the frame 12. When the jackscrew head 58 is turned, the screw 55 is rotated to shift the stop 53 for suitable adjustment to control the degree of broom letdown.

The invention also contemplates the provision of an adjustable device operable through one of the line portions 40 to differentially control tilting of the broom axis with respect to horizontal. This adjustment is otherwise referred to as a so-called "cone" adjustment, whereas the previously referred to broom letdown control is known as "strike" adjustment. The cone adjustment device comprises a take-up carried to differentially wind a line portion 40 at one of the sheaves 42. For example, the left line portion 40 in FIG. 7 has its end connected to a threaded part 59 of the device 60 advanced and retracted by a nut 61 of that device. The nut bears against a stop 62 carried by the left sheave 42. Accordingly, the left line portion 40 is adjustably taken up or let down to differentially control tilting of the broom axis with respect to horizontal.

Winding of the line portions 40 on the sheaves 42 is effected in response to operation of an actuator controlling rotation of the tubular member 43 and the sheaves 42, these defining rotary structure. The actuator typically includes another sheave 42a connected to rotate with the tubular member 43, a drive 63 movable between advanced and retracted positions, and a flexible line 64 to transmit force between the actuator and the sheave 42a upon which the line 64 is wound. The drive 63 is shown to include a crank 65 pivoted at 66 to the frame 12, to-

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gether with a plunger rod 67 having pivoted connection at 68 to the crank. The plunger 67 has a piston connected therewith within a fluid pressure cylinder 69 pivoted to the frame at 70. Referring to FIGS. 2 and 5, pressure transmitted at 71 to the cylinder 69 advances the plunger 67 to carry the pivot 72 over-center with respect to the pivot 66. Pivot 72 connects the line 64 with the crank 65, whereby the trash displacing apparatus including the broom and conveyor structure is positively held in raised position for traveling. When fluid pressure is admitted to the cylinder 69 at 73, the plunger 67 retracts as seen in FIG. 2 for lowering the trash displacing apparatus.

In accordance with a further aspect of the invention, the trash conveyor apparatus 23 is also raised and lowered in response to rotation of the tubular member 43 as controlled by the actuator. For this purpose, left and right sheaves 75, as seen in FIG. 7, have line portions 76 in the form of chains wound thereon, the lower ends of the chains connected at 77 to the trash elevator apparatus. The sheaves 75 are integral with the tubular member 43 to rotate therewith. In lowered position of the apparatus 23, the line portions 76 are slack as seen in FIG. 2, whereby the elevator is supported against further downward motion by stop pads 78 carried by the vehicle frame. The broom 17 then floats vertically with respect to the elevator mechanism, as accommodated by the torsion bar.

Supports for the tubular member 43 include bearings 85 and uprights 86. Vehicle side panels are indicated at 87.

I claim:

1. In combination with a street sweeper vehicle, trash displacing apparatus, and a single means to support and move said apparatus between raised position for travel and lowered position in which said apparatus is operable to displace trash, said means including a torsion bar for transmitting loading imposed by said apparatus accompanied by torsional deflection of said bar providing resilient support for the apparatus in lowered position only.

2. The combination of claim 1 in which said means includes a flexible line to transmit said imposed loading so as to suspend the apparatus during movement between said raised and lowered positions, and structure rotatable to wind and unwind the line respectively to raise and lower said apparatus, the torsion bar being connected to resist rotation of said structure acting to unwind the line in lowered position only.

3. The combination of claim 2 in which said structure includes an axially generally horizontally elongated member receiving said torsion bar, the line including axially spaced portions, said structure including axially spaced sheaves connected to said member for common rotation to wind and unwind said line, and including an actuator to control rotation of said structure.

4. The combination of claim 2 in which said trash displacing apparatus comprises a street sweeping broom.

5. The combination of claim 3 in which said trash displacing apparatus comprises a street sweeping broom and a trash conveyor to elevate trash swept into the conveyor by the broom, one line portion operable to suspend the broom being taut in broom lowered position, and another line portion operable to suspend the conveyor being slack in conveyor lowered position.

6. The combination of claim 4, including an adjustable device operable to control load resisting torsional deflection of the torsion bar, thereby to control the degree of letdown of the broom against a street surface.

7. The combination of claim 6 in which said device includes a holder part integrally rotatable with a section of the torsion bar, and a stop part to limit rotation of the holder part, one of said parts being adjustably shiftable relative to the other.

8. The combination of claim 2 in which said structure includes generally axially spaced sheaves rotatable together to wind and unwind said line portions, said apparatus comprising a rotary street sweeping broom having a generally horizontal axis, said means including pivoted

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arms supporting the broom at axially opposite ends thereof, said line portions supporting said arms.

9. The combination of claim 8 including an adjustable device operable through one of said line portions to differentially control tilting of the broom axis with respect to horizontal.

10. The combination of claim 9 in which said device comprises a take-up carried to differentially wind said line portion at a sheave.

11. The combination of claim 3 in which said actuator includes another sheave connected to rotate with said structure, a drive movable between advanced and retracted positions, and a flexible line to transmit force between the actuator and said other sheave and wound by said other sheave.

12. The combination of claim 1 in which the torsion

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bar has dual segments, and including an enclosure for the torsion bar, a flexible line to transmit said imposed loading so as to suspend the apparatus during movement between raised and lowered positions, the line being subject to winding and unwinding in response to rotation of said enclosure, the bar connected to resist unwinding of the line.

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