

Nov. 17, 1970

N. F. BROWN

3,540,070

PIVOTABLE SECTION FOR BOTTOM OF HOPPER ON SWEEPING MACHINE

Filed April 11, 1968

2 Sheets-Sheet 1

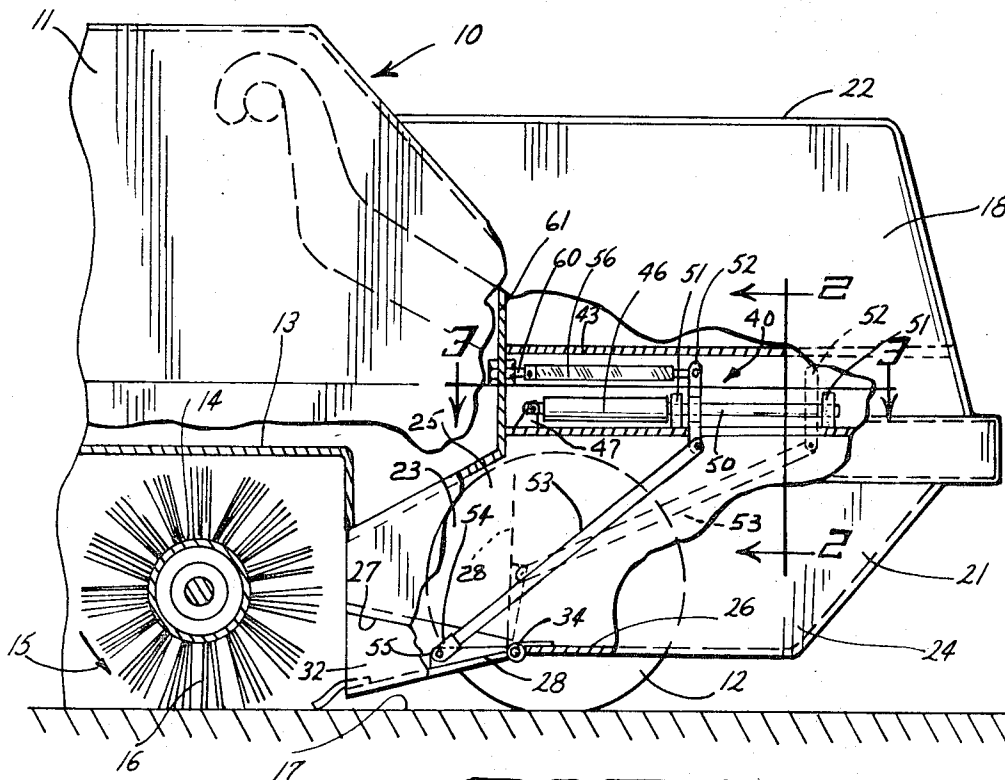


FIG. 1

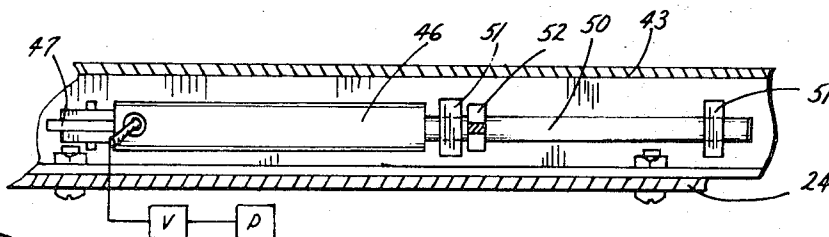


FIG. 3

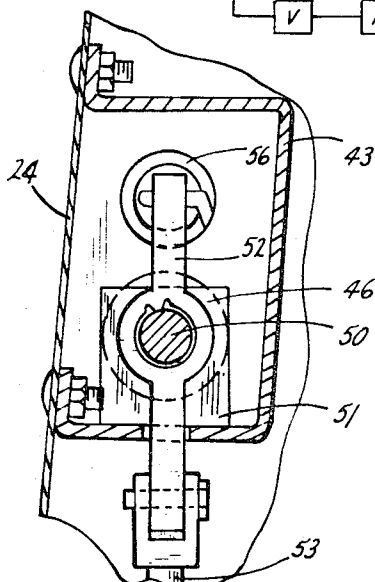


FIG. 2

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FIG. 5

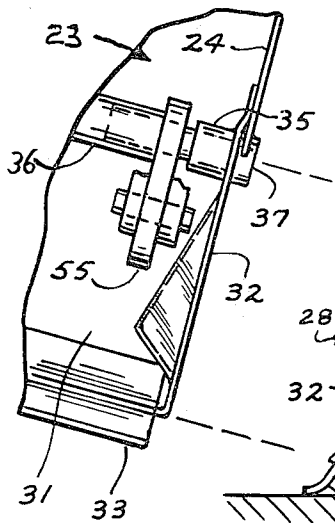


FIG. 4

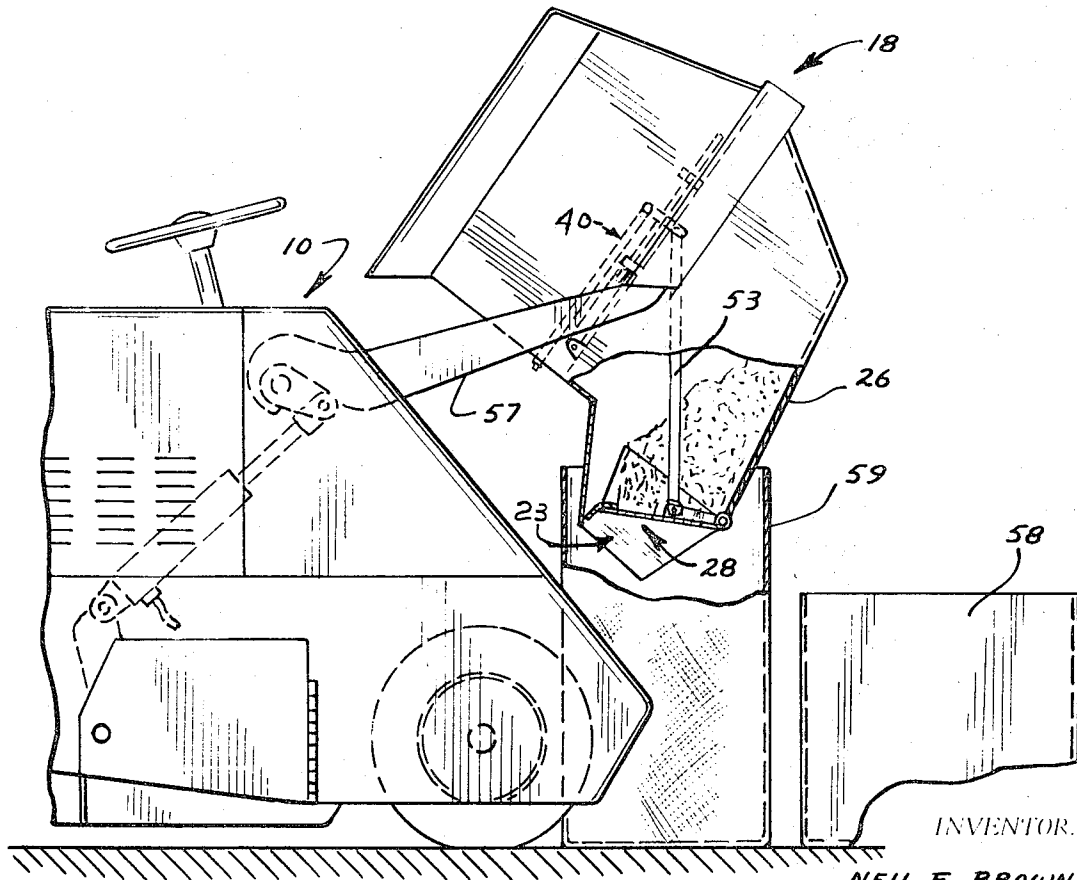
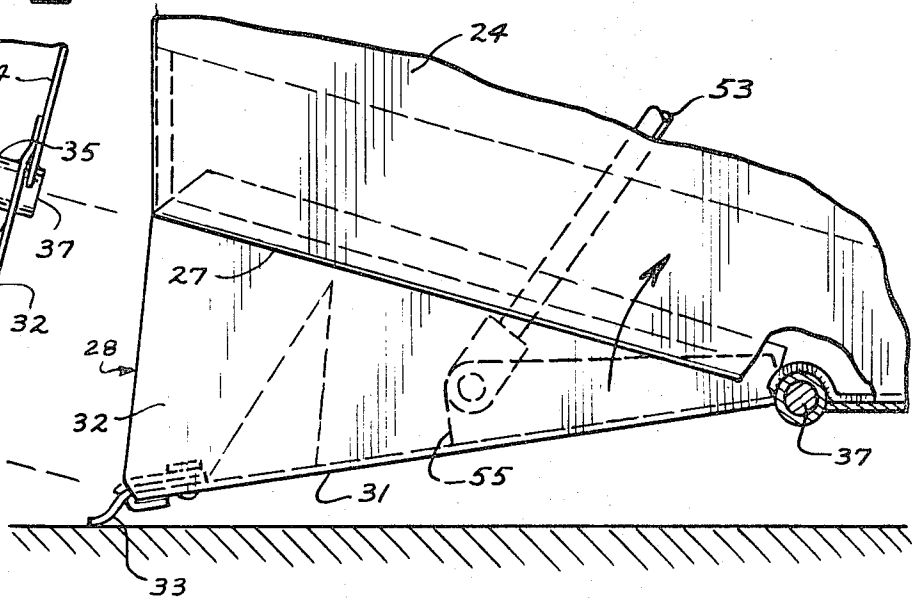


FIG. 6

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3,540,070

PIVOTABLE SECTION FOR BOTTOM OF HOPPER ON SWEEPING MACHINE

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Int. Cl. E01h 1/04

U.S. Cl. 15—83

6 Claims

ABSTRACT OF THE DISCLOSURE

A pivotable bottom lip section adjacent to the opening of a dust and debris hopper of a mobile sweeping machine, which section can be manipulated about its pivot to pack debris or paper into the main dust storage compartment. The pivotable lip section can also be moved to position where it substantially closes off the opening of the hopper to prevent debris carried in the hopper from shaking out during transport, or to retain the debris until the hopper is moved to a dumping position at a desired location.

BACKGROUND OF THE INVENTION

The present invention in relation to improvement over the structures shown in U.S. Pat. Nos. 3,304,572 and 3,160,908 by providing means to increase the storage capacity of dust hoppers by permitting a packing and hopper closing action through the use of a movable section of the hopper bottom adjacent to the sweeper opening of the hopper.

SUMMARY OF THE INVENTION

A movable section of the bottom wall adjacent to the opening of a dirt and debris hopper of a sweeping machine and which can be actuated by the operator to either substantially close off the hopper opening (which is used both as an inlet and dumping opening). The lip also can be used to aid in the packing of swept material into the hopper to obtain greater capacity. The invention finds use in mobile sweeping machines, in particular, by increasing the effective load capacity of the machine so that fewer trips to the dumping area have to be made, and also by permitting the opening of the hopper to be closed off during transport to prevent debris from dribbling out of the hopper.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary side elevational view of a mobile sweeping machine having a debris hopper with a movable bottom wall section made according to the present invention installed thereon;

FIG. 2 is an enlarged sectional view taken as along line 2—2 in FIG. 1;

FIG. 3 is an enlarged sectional view taken as on line 3—3 in FIG. 1;

FIG. 4 is a fragmentary enlarged side elevational view of a movable bottom wall section of a hopper made according to the present invention;

FIG. 5 is a fragmentary end view of the device in FIG. 4; and

FIG. 6 is a view showing a sweeping machine having a hopper made according to the present invention being held in a dumping position.

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DESCRIPTION OF THE PREFERRED EMBODIMENT

A sweeping machine illustrated generally at 10 is of a usual type, such as that shown in U.S. Pat. No. 3,304,572 and U.S. Pat. No. 3,160,908, both issued to G. H. Tennant Company. The machine includes a frame member 11 supported by wheels 12 for movement over a surface. The frame member includes a brush housing 13 rotatably mounting a substantially cylindrical brush 14 for sweeping movement about its longitudinal axis. The brush is powered through suitable mechanism (not shown) for sweeping movement in the direction as indicated by the arrow 15. Bristles 16 of the brush engage a surface 17 to sweep dirt and debris in a direction toward an opening of a dust and debris receiving hopper assembly 18.

The hopper assembly 18 can be of the construction shown in the above mentioned United States Patents, and includes a lower section 21 where the swept debris material is held, and as shown has an upper section 22 that can house suitable filters. A vacuum is applied to the hopper assembly 18 in the manner shown in U.S. Pat. No. 3,304,572 so that there is an air flow through an opening 23 (both inlet and discharge) of the hopper and through the upper section which houses the filters. Dust is separated from the air in the filter section.

The hopper includes a pair of side walls 24 and 25 which are spaced apart a distance generally corresponding to the width of the machine. This width is substantially the same width as the cylindrical brush 14.

A lower or bottom wall 26 joins the side walls 24 and 25. As shown, the side walls 24 and 25 are cut upwardly along a line 27 adjacent the rear portions thereof and a movable bottom wall or lip section 28 is provided at the hopper inlet.

The movable section 28 comprises a pan member having a bottom wall 31 and a pair of substantially triangular shaped side walls 32 on opposite sides thereof and positioned to slide just inside the side walls 24 and 25, of the hopper, respectively. A flexible strip of material 33 is provided at the rear portion of the lower wall 31. The strip 33 engages the ground surface as the machine moves along, and material (dirt and debris) swept by the brush 14 will be swept across this strip of material and into the lower portion of the hopper. The bottom wall, side walls and a top wall define the opening 23.

As shown, the bottom wall 31 of the movable or lip section 28 is pivotally mounted to the rear edge of the bottom wall 26 about an axis 34 that extends transversely across the machine. The connection is actually made in any suitable manner but can include, as shown, a pair of bushings 35 one attached to each of the side walls 24 and 25 of the hopper, and which align with a tube 36 fixed adjacent the leading edge of bottom wall 31 of the movable section 28 and extending across the hopper lip. A separate pin 37 can then be inserted through the bushings on each side of the machine and partially into the ends of tube 36 to hold the section 28 pivotally assembled to the main hopper. The pins 37 will be held in place by any suitable manner. The junction between the bottom wall section 31 and the bottom wall 26 can be sealed to prevent debris from leaking through in any suitable manner, such as providing a shield over this junction.

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The movement of the movable section 28 about its axis 34 is controlled through an actuator arrangement illustrated generally at 40. This actuator arrangement includes a hydraulic cylinder 46 mounted onto a bracket 47 which is fixed with respect to a frame 43 attached to the wall of the hopper and positioned inside the hopper.

The cylinder has an elongated rod 50 actuated by an internal piston so that the rod can be extended when the cylinder is actuated. The rod 50 is guided by bushings 51 that are attached to frame 43. An arm 52 is mounted onto the rod 50 and is held in place with snap rings so it moves with the rod. The lower portion of the arm 52 extends through a provided slot in the bottom of frame 43. The lower end of arm 52 is pivotally mounted to one end of a link 53. The other end of the link 53 is pivotally mounted as at 54 to a lug 55 that in turn is fixed to the bottom wall of the lip assembly 28. The link 53 has suitable adjustment means so that the length of the link can be changed so as to make sure that the movable section 28 is properly positioned for sweeping when the hydraulic cylinder assembly 46 is in its retracted position, as shown in solid lines in FIG. 1.

A spring 56 is fastened to the arm 52 on one end thereof and is fastened to an eye bolt 60 at its other end. The eye bolt 60 in turn is fastened to the rear wall 61 of the hopper assembly at the other end. The spring 56 acts as a return spring for the movable section 28 and tends to return the cylinder 46 to retracted position.

The hydraulic cylinder assembly 46 is connected to a suitable source of hydraulic fluid under pressure and is controlled with a valve by the operator of the vehicle. Upon directing fluid under pressure into the base end of the cylinder, the internal piston is forced outwardly, forcing the rod 50 to move the arm 52. This will cause the arm 52 to go to its position shown in dotted lines in FIG. 1 which in turn will raise the movable section 28 to its dotted position shown in FIG. 1. The bottom wall 31 of the movable assembly will thus be flipped upwardly and forwardly about its axis 34 causing the debris resting on the wall to be thrown forwardly into the main part of the hopper. Note that the wall 31 can actually go past a vertical position with the hopper in a normal sweeping position.

This actuation can be done during sweeping operation to pack the debris more evenly in the hopper and make sure that the forward portions of the hopper (remote from brush 14) are filled. The movable section is extremely valuable where there is a great deal of light material such as paper which does not travel very far after being thrown by the brush 14. Paper and the like normally collects adjacent the opening to the hopper and results in having to dump the hopper more often or having to pack the debris by hand.

Also, as can be seen, when the movable assembly 28 is in an intermediate position, it substantially closes off the opening 23 of the hopper assembly so that debris in the lower portion of the hopper cannot shake out rearwardly while the vehicle is being transported. The valve controlling the cylinder 46 can be left in a neutral position to hold the lip in any desired position. The valve is moved to a released position to permit the spring 56 to return the cylinder 46 to its retracted position.

Referring to FIG. 6, the hopper lip assembly is shown in its raised position, and the debris in the hopper is thus held in place when the hopper is lifted. In the vehicle shown, lift arms 57 are provided for raising the hopper assembly. The lift arms are actuated by a hydraulic cylinder, and engage pins on an external frame. This is shown in greater detail in the U.S. Pat. No. 3,304,572. The lifting of the unit normally lowers the opening 23 of the hopper (the opening faces downwardly). By holding the movable assembly 28 in a closed position with the cylinder-piston assembly, the debris is held within the hopper until it is properly positioned.

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Two ways of storing the debris are shown. In the first, a large bag 59 is used. The bag mouth is held around the opening of the hopper after the hopper is raised to dumping position. When the bag is properly positioned and held in place, the movable section 28 is released to dump the material into the bag. The bag can be closed with a drawstring or the like and hauled away. This eliminates dust and debris from flying around during the dumping operation.

Alternately the hopper can be positioned over a receptacle 58 that can be used for storage of large amounts of swept material. Once the unit is over the receptacle 58, the section 28 is returned to its normal position and the dirt and debris will be dumped into the receptacle. This eliminates an unwanted loss of debris until the unit is properly positioned for dumping.

It can also be seen that the use of the triangular walls on the lip assembly permits the rear parts of side walls 24 and 25 of the hopper to be trimmed to provide greater vertical clearance when the hopper is lifted.

Also, the main bottom wall 26 of the hopper can have a greater ground clearance when operating. The movable extension or section can be raised out of the way to pass over objects if necessary.

This is so because the movable section can be at a greater angle with respect to surface 17 than a stationary bottom wall. If material lodges on the movable section because of a greater angle, it can be flipped forwardly into the main part of the hopper. An added advantage is that the movable section will raise (or can be raised) to permit larger, bulkier objects to pass underneath so the brush can reach them. The movable section will drop down right away under urging of spring 56 and be in position to receive the bulky object when the brush sweeps it forwardly. With a fixed bottom wall as in previous machines, light bulky objects would be dragged by the bottom wall of the hopper and could not be readily swept into the hopper.

The hydraulic actuator of cylinder 46 can be replaced with a manual handle in certain instances or a control cable or rope can be used. The spring 56 will always return the movable section to its sweeping position when the actuator (either hydraulic or manual) is released.

In dumping the hopper the movable section can be actuated rapidly to shake and vibrate the hopper to make sure the emptying is complete.

What is claimed is:

1. A sweeping machine having a sweeping brush and a storage hopper for receiving swept material from the brush, said hopper having a movable first wall section, a main part that includes a second bottom wall section and an opening adjacent the brush to permit passage of material from the brush into the hopper, first means for pivotally mounting said first wall section on the main part to pivot about a transverse axis between a normal position permitting material being swept to pass through said opening and an actuated position, said first wall section being of a size to substantially close said opening when it is in an actuated position, and second means connected to said first wall section for moving said first section about said transverse axis between its normal position and its actuated positions.

2. The combination as specified in claim 1 wherein said hopper is mounted onto a mobile sweeping machine, said sweeping machine having lift arm means for lifting said hopper to a position wherein said opening faces in a direction generally downwardly, and means to retain said movable section in said actuated position during movement of said lift arm means.

3. The combination as specified in claim 1 wherein said second means comprises a link attached to said first wall section, an actuator arm, means to connect said actuator arm and link, and actuator means for moving said actuator arm to cause said link to actuate said first wall section.

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4. The combination as specified in claim 3 and spring means operable to urge said actuator arm to a normal position.

5. The combination as specified in claim 4 wherein said actuator means includes a hydraulic cylinder connected to move said actuator arm when the cylinder is extended or retracted. 5

6. The sweeping machine of claim 1 wherein said first wall section in a normal position in part defines said opening. 10

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References Cited

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EDWARD L. ROBERTS, Primary Examiner

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,540,070 Dated November 17, 1970

Inventor(s) Neil F. Brown

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 61, before "section" insert --wall--; Column 4, line 62, "positions" should be --position--.

SIGNED AND
SEALED
MAR 2 1971

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents

REEXAMINATION CERTIFICATE (656th) **United States Patent** [19] [11] **B1 3,540,070** **Brown** [45] Certificate Issued **Mar. 31, 1987**

[54] **PIVOTABLE SECTION FOR BOTTOM OF HOPPER ON SWEEPING MACHINE**

[75] Inventor: **Neil F. Brown**, Minneapolis, Minn.

[73] Assignee: **G. H. Tennant Company**,
Minneapolis, Minn.

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Reexamination Request:

No. 90/001,043, Jun. 27, 1986
No. 90/001,053, Jul. 11, 1986

Reexamination Certificate for:

Patent No.: **3,540,070**
Issued: **Nov. 17, 1970**
Appl. No.: **720,503**
Filed: **Apr. 11, 1968**

FOREIGN PATENT DOCUMENTS

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15559	10/1956	Japan
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Primary Examiner—Edward L. Roberts

Certificate of Correction issued Mar. 2, 1971.

[51] Int. Cl.⁴ **E01H 1/04**

[52] U.S. Cl. **15/83**

[58] Field of Search **144/193 A**

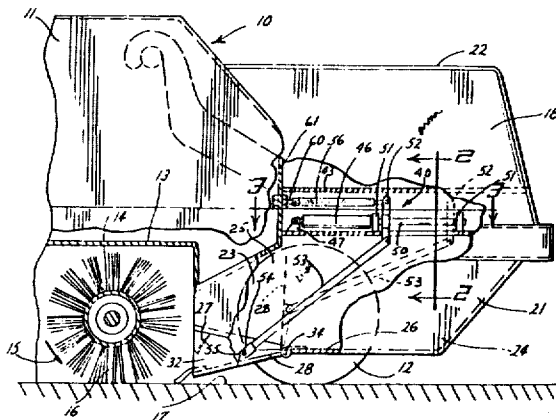
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[57] **ABSTRACT**

A pivotable bottom lip section adjacent to the opening of a dust and debris hopper of a mobile sweeping machine, which section can be manipulated about its pivot to pack debris or paper into the main dust storage compartment. The pivotable lip section can also be moved to position where it substantially closes off the opening of the hopper to prevent debris carried in the hopper from shaking out during transport, or to retain the debris until the hopper is moved to a dumping position at a desired location.



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REEXAMINATION CERTIFICATE ISSUED UNDER 35 U.S.C. 307

THE PATENT IS HEREBY AMENDED AS
INDICATED BELOW.

Matter enclosed in heavy brackets [] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS
BEEN DETERMINED THAT:

Claim 2 is cancelled.

Claim 1 is determined to be patentable as amended.

Claims 3-6, dependent on an amended claim, are determined to be patentable.

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1. A sweeping machine having a sweeping brush and a storage hopper for receiving swept material from the brush, said hopper having a movable first *bottom* wall section, a main part that includes a second bottom wall section, and an opening adjacent the brush to permit passage of material from the brush into the hopper, first means for pivotally mounting said first *bottom* wall section on the main part to pivot about a transverse axis between a normal position permitting material being swept to pass through said opening and an actuated position, said first *bottom* wall section being of a size to substantially close said opening when it is in an actuated position, and second means connected to said first *bottom* wall section for moving said first *bottom* wall section about said transverse axis between its normal position and its actuated position, *wherein said hopper is mounted onto a mobile sweeping machine, said sweeping machine having lift arm means for lifting said hopper to a position wherein said opening faces in a direction generally downwardly, and means to retain said movable bottom wall section in said actuated position during movement of said lift arm means.*

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