

[54] POWER VACUUM TRUCK

[72] Inventor: Vernon L. Klawitter, 1300 West Bartlett Road, Wichita, Kans. 60120

[22] Filed: Dec. 15, 1969

[21] Appl. No.: 884,788

[52] U.S. Cl. 15/340, 15/83, 15/385
[51] Int. Cl. A471 5/00
[58] Field of Search 15/340, 347, 87, 78, 83, 349, 15/385

[56] References Cited

UNITED STATES PATENTS

2,830,510	4/1958	Mariani et al.	15/340 X
3,054,130	9/1962	Ferrari	15/340
3,189,932	6/1965	Daneman	15/340
3,221,358	12/1965	Dickson	15/340
3,436,788	4/1969	Tamny	15/340
993,603	5/1911	Jones	15/87 UX
2,248,699	7/1941	Finnell	15/340 UX
2,317,843	4/1943	Backlund	15/385 UX
3,186,021	6/1965	Krier et al.	15/340

FOREIGN PATENTS OR APPLICATIONS

1,272,327	7/1968	Germany	15/340
6,801,511	9/1968	Netherlands	15/340

Primary Examiner—Edward L. Roberts
Attorney—Hill, Sherman, Meroni, Gross & Simpson

[57] ABSTRACT

A mobile power vacuum truck includes a vacuum producing means having a pressure outlet to a collection box and a suction inlet communicating with a hood of a generally self-contained vacuum pick-up head assembly attached to the forward end of a street sweeper vehicle and movable laterally of the direction of travel of the vehicle. The sweeper pick-up head assembly includes a pair of counterrotating brooms tangentially intermeshing whereby sweepings are partially broken up and directed to a debris pick-up area centrally located behind and rearwardly of the brooms. A suction hood or enclosure overlies the brooms and has depending sides at least rearwardly and forwardly of the brooms. The rearward side converges to the opening of the vacuum suction passageway whereby the sweepings are conveyed to a collection box as the apparatus moves along.

14 Claims, 4 Drawing Figures

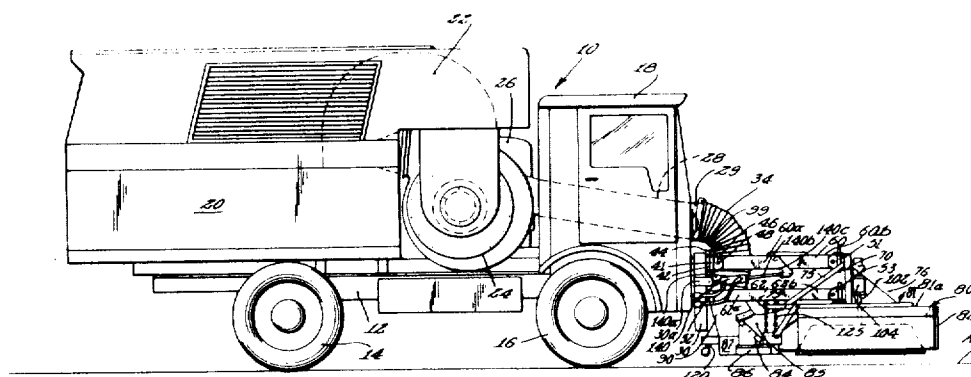


Fig. 3

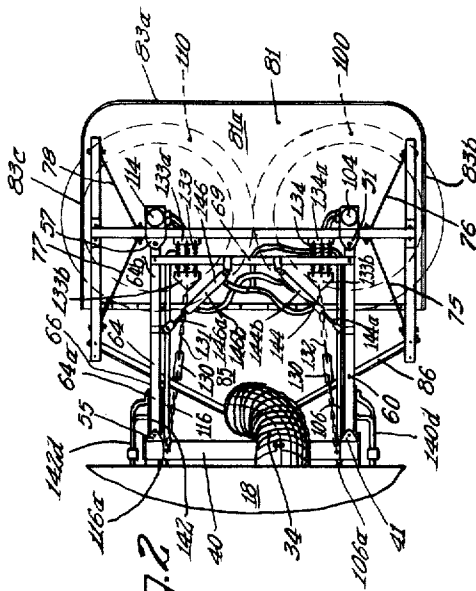


Fig. 2

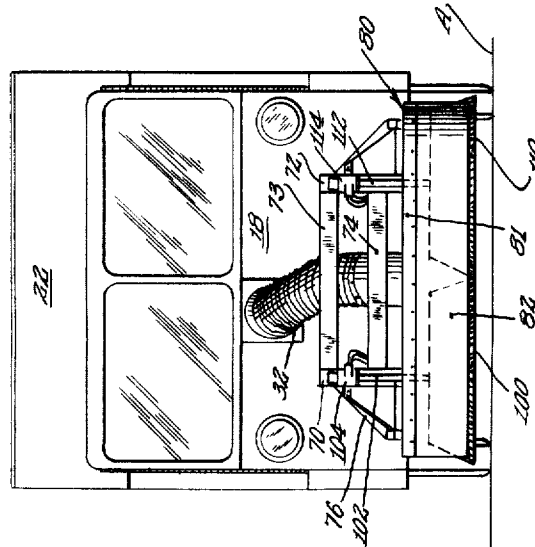
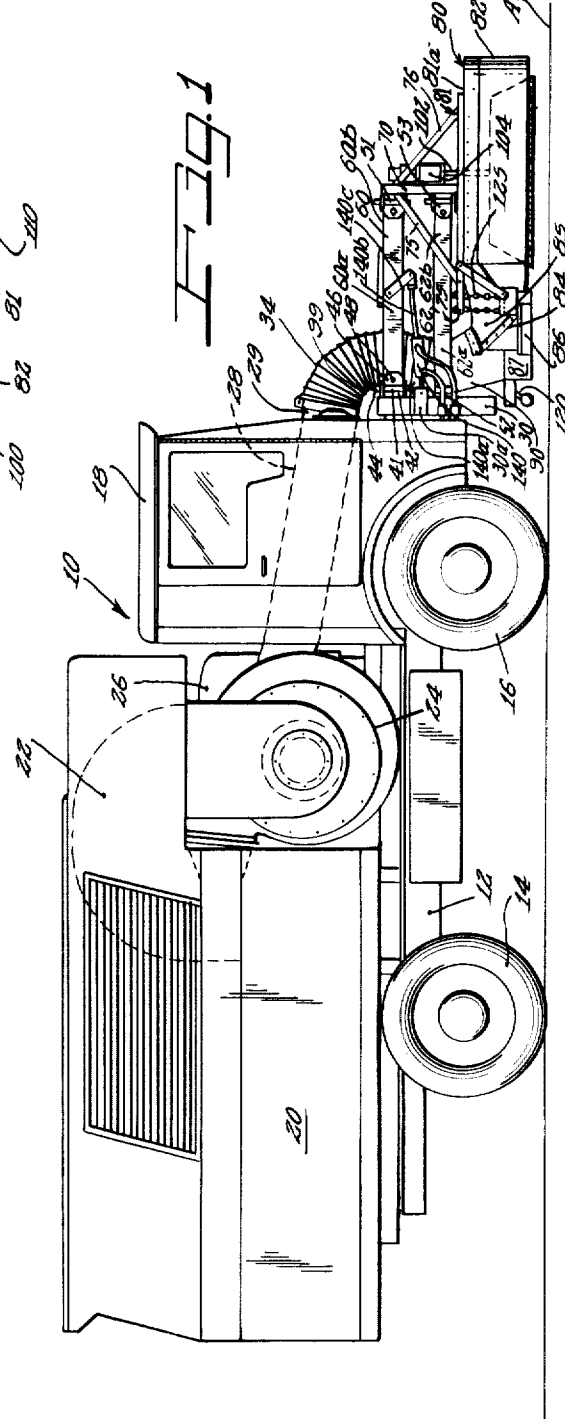


Fig. 1



INVENTOR

Vernon L. Klawitter

BY Hill, Sherman, Mewin, Marshall & Associates ATTORNEYS

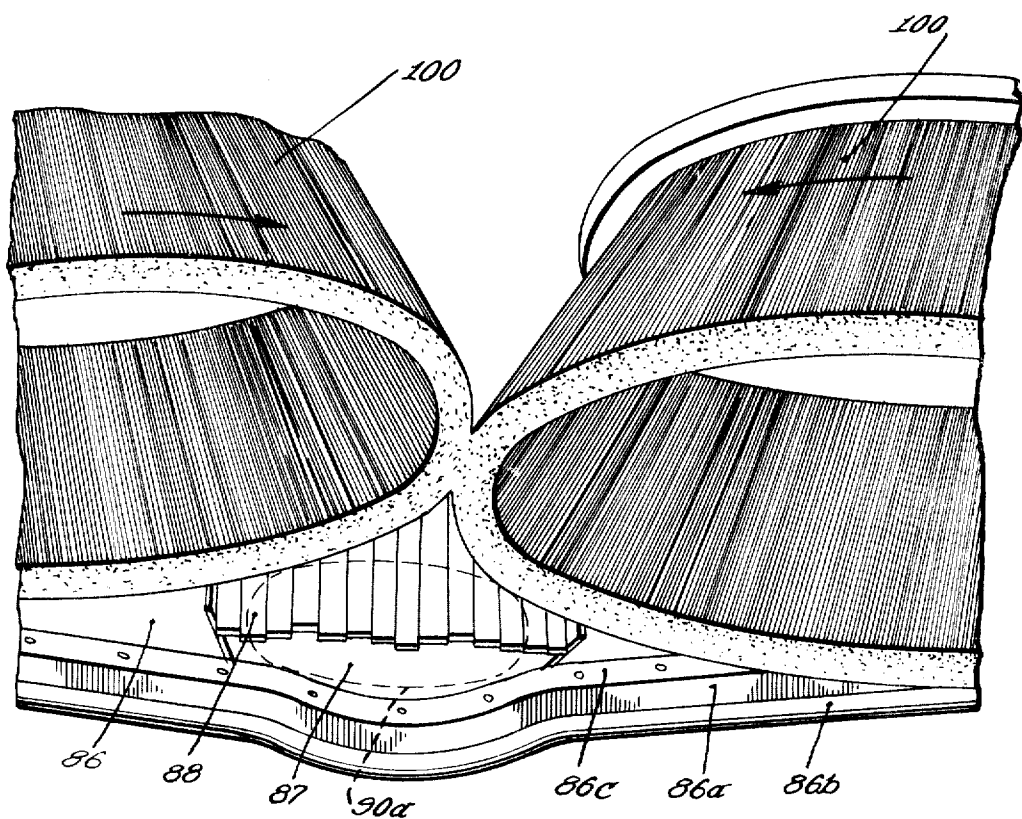


Fig. 4

INVENTOR

Vernon L. Klawitter

BY

Hill, Shuman, Orsini, Gross & Lipson ATTORNEYS

POWER VACUUM TRUCK

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention generally relates to mobile street sweeping apparatus and more particularly contemplates a laterally movable pick-up head assembly therefor including a pair of sweepers and a surrounding hood to which a suction source is attached whereby debris is swept by the brooms to the area of a suction inlet and transferred therefrom to a dump receptacle on the mobile apparatus.

2. Prior Art

While it is known in the prior art to provide a vehicle having forwardly mounted brooms and a suction arrangement therewith to remove dirt and debris from a street area as shown for example by the apparatus illustrated in U.S. Pat. No. 3,186,021, we have discovered many disadvantages in this type of prior art device which our invention overcomes.

SUMMARY OF THE INVENTION

According to the present invention there is provided a generally self-contained vacuum pick-up head assembly attached to the forward end of a street sweeper vehicle and movable laterally of the direction of travel of said vehicle. The head assembly includes a pair of generally tangential intermeshing brooms rotatable in opposite directions about generally vertical axes thereby to direct sweepings to a suction pick-up area rearwardly of the brooms. A suction hood or enclosure generally overlies the brooms and has depending sides at least rearwardly and forwardly of the brooms and in such other peripheral positions as will prevent dust and dirt from escaping and/or allow the maintenance of adequate suction within the hood and particularly in the suction pick-up area. The sides have bottom edges positioned in proximate relation to a road surface being swept by the brooms.

The rearward sides of the hood converge to the location of the suction pick-up area where an internally unobstructed open suction duct communicates with the interior of the hood and serves to remove the swept debris and dirt. This area is rearwardly of the brooms and generally in the area of their tangency so that the full effect of their sweepings is deposited in the suction pick-up area. The intermeshing moreover assures a complete clean sweep across the path of travel of the brooms and also serves to achieve a disintegrating, particle size reducing action on dirt and debris being swept inwardly and between the brooms with the result that the effect of the suction force is maximized.

The means mounting the hood means for lateral movement with respect to the vehicle includes a plurality of arms each pivotally connected at a first end thereof to a support member mounted on the vehicle and each of the arms is pivotally connected at a second end thereof to the hood means to produce a parallelogram relationship between the arms, support member and hood structure. A first power means may be connected between the support member on the vehicle and intermediate the ends of at least one of the arms whereby it will serve to move the hood means in a generally vertical direction. A second power means may be connected between at least one of the arms and the hood means to move the hood means in a horizontal direction. Other placements of the power means to accomplish the same result are of course contemplated by this invention.

The hood means may include a frame work comprising upwardly extending support members having the second end of the arms attached thereto. A drive means for the brooms is readily supported by the hood means and includes a drive shaft extending through the hood to the broom. Suitable support braces for the upright member are included in the hood framework. The hood mounting means may further include a resilient shock and movement dampening means connected between the support bar and the framework on the hood means.

According to the invention herein the hood means includes a first hood portion containing the suction supply opening which portion has a ground engaging wheel means connected therewith adapted to retain the first hood portion in a fixed relation to the ground surface over which it moves. A second hood portion carries the broom means and is connected to first hood portion by means of a flexible interconnecting hood piece so that the second portion may move relative to the first hood portion. The pick-up head is movable in a plane above a ground surface to be swept through an arc of approximately 180° from a position beyond one side of the vehicle to a position beyond the opposite side.

From the above summary it may be seen that a very simple, easily maintained street sweeper with a vacuum pick-up head assembly laterally movable from side to side in front of the carrying vehicle provides great efficiency and flexibility in operations. Thus, lane dividers, islands, berms and sidewalks along a street may be cleaned by a street sweeping vehicle moving along the street without appreciably disrupting traffic. Rapid movement of the vacuum pick-up head assembly allows the avoidance of obstructions while maintaining maximum cleaning effect. Also, such points as indentations in a curb to accommodate drains may be reached by the laterally movable pick-up head.

These and other objects, features and advantages of the present invention will be understood in further detail from the following description in the associated drawings wherein reference numerals are utilized in designating an illustrative embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view of an adaption of the vacuum pick-up head assembly apparatus of the present invention at a raised position above a road surface;

FIG. 2 is a plan view of the vacuum pick-up head assembly of FIG. 1;

FIG. 3 is a front elevational view of the apparatus of FIG. 1;

FIG. 4 is a perspective view taken from below the hood looking upwardly into the hood toward the suction pick-up area.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The power vacuum truck 10 as may be seen in FIG. 1 comprises a chassis 12 supported by pairs of wheels 14, 16. A cab 18 is mounted at a forward end of the chassis 12 and a receptacle body 20 is mounted toward the rear of the chassis. Opening into the interior of the receptacle body 20 is a passageway 22 which communicates with the outlet side of a conventional suction producing means 24. Power for the suction means 24 is provided by an adjacent conventional mobile power unit 26 which may be mounted on the chassis 12. A passageway 28 communicates from the suction side of the suction means 24 to a forward external opening 29 which is advantageously located on the front of the cab 18.

A support bar member 30 attached to the cab 18 or directly to the chassis 12 includes thereon one or more universal joints each having an elongated arm member extending therefrom. The universal joints may be of known construction and as shown in my preferred embodiment a typical universal joint 41 includes bracket means 42 extending from the support bar 30. A suitable bolt means 44 extends through the bracket means 42 and through a pivot connector 46 so that the pivot connector 46 may swivel about the bolt 44 in a generally horizontal plane. A first elongated arm member 60 is attached to the pivot connector 46 at a first end 60a by means of a horizontally disposed connector means 48 whereby the universal movement of the arm 60 is completed. This universal movement of the arm about a universal joint is duplicated at the second end 60b of the first arm which pivots on universal joint 51 and at the first and second ends of each of the other support arms which may be provided. Thus, as shown in the illustrated embodiment a second support arm 62 is pivoted

at a first end 62a by means of a universal joint 52 and at a second end 62b about a universal joint 53. Referring now to FIG. 2 it may be seen that a third arm 64 pivots at a first end 64a about a universal 55 and at a second end 64b about a universal 57. A fourth arm corresponding in size and function to the arm 62 is not directly shown but its position is indicated at 66 behind arm 60 in FIG. 1 and below arm 64 in FIG. 2 as will be readily understood by those skilled in the art. Each of the first, second, third and fourth arms 60, 62, 64 and 66 is parallel to one another and pivots about its respective universal end joints in parallelogram relation. This parallelogram type linkage allows movement of the pick up head laterally of the vehicle for sweeping an area in excess of or beyond the machine width. During lateral movement the pick up head maintains a parallel disposition to present a full pick up head width in the direction of travel.

The universal joints 51, 53 are each attached to a first external structure framework portion 70 upstanding from one side of the hood means generally indicated at 80. Similarly, the universal joint 57 and a universal joint not shown are attached to a second upstanding portion 72 of the hood framework. A pair of elements 73, and 74 are each connected to and extend in generally parallel relationship between the upstanding members 70 and 72. Suitable bracing members such as the members shown at 75, 76, 77 and 78 may be provided to assure a rigid truss-like external framework for the mounting and support of the hood means 80. While the exact structural framework will depend on various design factors, it has been found that the illustrated mounting means for the hood means 80 are simple in construction and very efficient and flexible in operation. Moreover, with this construction maintenance of the apparatus is easy and minimal.

According to the illustrated embodiments of the invention the hood means 80 comprises a first portion 81 generally overlying and carrying the broom means 100, 110, and a second hood portion 84 containing a suction supply opening and having a ground surface engaging wheel means 120 therewith adopted to retain the second hood portion in a generally fixed relation to the ground surface over which the apparatus travels when cleaning.

The first portion 81 has an upper portion 81a to which the external frame members including members 70, 72 and 74-78 are attached. The first portion 81 of the hood means 80 generally overlies a broom means which may comprise first and second brooms 100, 110 respectively, each of which are adapted to rotate in opposite directions as illustrated by the arrows and about generally vertically disposed axes 102 and 112 respectively. The construction of the individual brooms 100, 110 is generally known in the art particularly with respect to side brooms.

A suitable drive means 104 and 114 serves to rotate each of the brooms 100, 110 respectively. The individual means for each broom may be advantageously attached to the vertically disposed frame portions, 70, 72 respectively and are connected to one end of the generally vertically disposed drive shafts 102, 112 which shafts pass through the upper portion 81 of the hood 80 and connect with the brooms 100, 110 respectively. The means of supplying power may advantageously include a hydraulic means fed by hydraulic power supply mounted on the chassis and conveyed through conduits 106 and 116 respectively. Suitable connections for the conduits to a power supply are provided at the front of the vehicle as shown at 106a and 116a in FIG. 2.

The hood means 80 further includes a flexible depending portion or apron 82 having a portion 82a which extends about at least a forward peripheral edge 83a of the first upper portion and portions 82b, 82c which extend about and depend from the upper portion side edges 83b, 83c respectively. A lower edge 82d of the apron 82 is proximate to the road surface A. A second hood portion 84 extends from the first hood portion 81 and has a rear continuance portion 85 sloping down to intersect a suction duct 90 above a suction pick-up area 87. A lower rearward side 86 of the second hood portion

84 extends from adjacent the depending apron 82 of the first hood portion 81 and converges to a suction pick-up location 87. This may as seen in greater detail in the FIG. 4 taken from below the hood looking upwardly into the hood toward the suction pick-up area. From this view it is clear that the converging rearward side 86 may have a lower edge portion 86a of a resilient material such as rubber for example, having an enlarged flexible bulbous portion 86b on the lowermost edge which portion 86b may be attached to the rearward side by a mounting means 86c. The depending portion of the hood surrounds the broom means 100, 110 as well as the suction pick-up area 87 and has such proximity to the street surface that together the front and side apron 82 and the converging rearward side 86 afford such enclosure forwardly and rearwardly of the broom means 100, 110 as to permit induction of air flow from about the brooms into the hood means 80 and maintenance of high velocity air flow therein into the suction duct conduit 90.

Directly behind the area of the intersection of the sweeping means 100 and 110 there is located the suction pick-up area 87. As shown in FIG. 4 the portion of the rearward wall directly surrounding the rear of the area 87 may bow outwardly to more nearly conform to the configuration of the suction pick-up duct 90. The brooms 100 and 110 counterrotate in the direction indicated by the arrows thereon so that sweepings from the brooms are moved directly to the pick-up area 87. The intermeshing of brooms 100 and 110 conventionally constructed of hard steel wire bristles not only assures a complete clear sweep across the path of travel of the brooms, but also serves to achieve a disintegrating particle size reducing action on dirt and debris being swept inwardly by and between the brooms in the direction of the arrows with the result that the effect of the suction force is maximized.

A suction source lead-in duct 90 has an opening 90a shown in dotted lines in FIG. 4 that communicates with the interior of the hood 80 in the suction pick-up area 87 to remove the sweepings up through the passageway 90 and into the collection box 20 through a series of communication passageways including in order the flexible passageway 34, the passageway 28 through the cab area and the passageway through the suction source 24.

The rear continuance portion 85 may be of a tough flexible material thereby to allow relative movement between the first and second hood portion 81, 84 respectively while maintaining a closed hood. A chain or similar means 125 is connected at a first end to a hood frame element 75 which is attached to and extends rearwardly from the first hood portion 81. The chain 125 is connected at its other end to the second hood portion 84 with the result that relative movement between the first and second hood portions is limited in one direction. Thus, the flexible portion 85 may easily compress when the broom moves toward the road surface, but it is protected against undue stretching when the brooms move away from the road surface.

Vertical movement of the pick-up assembly caused by uneven road surface, etc., is dampened by a shock absorbing means 130 as seen in FIG. 2 which advantageously comprises a pair of chains 131, 132 each connected between the mounting member 30 and the hood means 80. Each include a resilient means such as sets of springs 133, 134 each having one end connected to a plate 133a, 134a on the hood means 80 and a second end connected to a plate 133b, 134b connected to the chain. Rigged in this manner the shock absorbing means dampens undesirable movement of the first hood portion of the pick-up bead assembly.

Interior of the hood means a flexible curtain means 88 may be provided in the vicinity of the suction pick-up area and particularly between the brooms and the rearward wall 86 of the suction pick-up area 87 to enhance the effectiveness of the suction pick-up. An embodiment of the means 88 that has been found effective is a piece of depending rubber slit as shown to allow passage of dirt and debris while minimizing possible dissipation of the suction.

A cross member 69 is pivotally attached at opposite ends to and extends between the arms 60, 64 at a point intermediate the first and second ends of the arms 60, 64.

Movement of the parallel support linkage arrangement is effected by power means arranged between the arms and their end supports. Thus, in the embodiment shown a power means 140 has a first end 140a pivotally attached to a clip 30a on the support member 30 and a second end 140b connected to a link member 140c, which link member 140c is in turn pivotally connected to the arm 60. A similar power means 142 is connected to the arm 64. The power means 140, 142 are preferably of a hydraulic piston type to which fluid is supplied by suitable connections 140d and 142d with a supply means on the truck body. The power means 140, 142 work in conjunction with each other to provide movement of the pick-up assembly about the front end support 30 in a generally vertical plane.

As will be understood by those skilled in the art, movement of the assembly in a generally horizontal plane is advantageously carried out by a pair of hydraulic cylinders 144, 146 placed between the cross piece 69 and each of the arms 60, 64 respectively. Each of the hydraulic power means 144, 146 is of a positive action type each having a respective piston 144a, 146a which slides in a cylinder 144b, 146b in response to changes in hydraulic pressures on opposite sides of the piston. The hydraulic pressure supply lines are cross-linked between the power means 144, 146 so that during lateral movement of the assembly when for example the piston 144a is being received to a greater extent in the cylinder 144b and the piston 146a is moving out of the cylinder 146b the hydraulic fluid is moving between the pressure sides of the cylinders as will be understood by those skilled in the art.

Since the hydraulic drive means for the broom drive means and the power movement means may be the same hydraulic power source conduits 106 and 116 may be used to power the power means 140, 142, 144 and 146. Suitable valves and connections necessary to produce the lateral movement will be understood by those skilled in the art.

Although minor modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

1. A vacuum pick-up head assembly carried by and forwardly of a streetsweeper vehicle for movement generally in an arc about a forward end of said vehicle while maintaining a parallel disposition relative to its previous position to present a constant full pick-up head width in the direction of vehicle travel, comprising a pair of circular brooms driven for rotation about generally vertical axes and positioned in peripherally intermeshing relation centrally of said assembly to receive between them debris swept inwardly by the brooms, a suction hood overlying the brooms and having depending sides forwardly and rearwardly of the brooms and having their bottom edges positionable proximate to a road surface being swept by the brooms, a debris suction duct communicating with the interior of the hood rearwardly of the brooms, means mounting the hood for elevational and movement with the brooms transversely of the vehicle to outward sweeping positions, the rearward sides of the hood converging to a suction location, and an internally unobstructed open suction tube leading from said location.

2. The assembly of claim 1, including means providing ground support for the hood beneath said rearward converging sides.

3. A sweeping unit attachable by parallelogram mounting means to a front of a streetsweeper vehicle for movement generally in an arc about said front while maintaining a parallel position relative to its previous position comprising a sweeping means, a suction hood means positioned generally about and above said sweeping means, said sweeping means being adapted to direct sweepings to a central rearward suc-

tion pick-up area, said hood means having a depending portion rearwardly converging to the location of an open suction tube that communicates with the interior of the hood in the area of said suction pick-up.

4. An apparatus according to claim 3 wherein said sweeping means directs sweepings to a single suction pick-up area.

5. An apparatus according to claim 3 wherein said means mounting said hood means for lateral movement with respect to said vehicle includes a pair of spaced parallel arms positioned generally in a horizontal plane each pivotally connected at a first end thereof by a universal type joint to a support member mounted on the vehicle and each pivotally connected by a universal type joint at a second end thereof to the hood means to form a parallelogram type linkage, and a first power means connected between said support member and said first and second ends of at least one of said arms moves said hood means in a vertical direction while a second power means connected between said arms and said hood means moves said hood means in a horizontal direction.

6. An apparatus according to claim 5 wherein said hood means includes an upper portion generally above said sweeping means and forward and side depending portions cooperating with said depending rearward portion to surround said sweeping means.

7. An apparatus according to claim 6 wherein said hood means further includes a framework comprising upwardly extending support members having said second end of said arms attached thereto, drive means being supported by said hood means including a shaft extending through said hood to said brooms to thereby drive the same.

8. An apparatus according to claim 5 wherein said hood mounting means further includes a resilient shock dampening means connected between said support member and said hood means.

9. An apparatus according to claim 3 wherein said hood means includes a first hood portion carrying said broom means and adapted to move vertically with said broom means, and a second hood portion containing a suction supply opening and having a ground surface engaging wheel means therewith adapted to retain said second hood portion in a fixed relation to said ground surface.

10. A power vacuum truck comprising a wheeled vehicle means having a front portion, a rear portion and two sides, said vehicle means supporting thereon a collection box means, a vacuum producing means, an operating control means and a vacuum sweeper pick-up means, said pick-up means being connected to said front portion of said vehicle and being movable by a linkage lift mechanism laterally of said vehicle for sweeping an area beyond said vehicle width, said linkage means maintaining said pick-up means in a substantially parallel disposition relative to its previous position, said pick-up means including dual, counterrotating, generally tangentially intersecting brooms rotatably about a generally vertical axis, a hood means overlying said brooms, a vacuum pick-up area communicating with the hood generally at the rear side thereof and behind the point where the brooms are generally tangential, a conduit means communicating from said vacuum pick-up area to a suction inlet side of said vacuum producing means through which said picked up matter passes on the way to said collection box.

11. An apparatus according to claim 10 wherein said pick-up head is movable in a plane above a surface to be cleaned through an arc of approximately 180° from a position beyond one side of the vehicle to a position beyond the other side.

12. An apparatus according to claim 10 wherein said operating control means is in a cab means on said front portion of said vehicle means, said suction duct having a first portion of a flexible conduit, said first portion being connected from said hood to a second duct portion on a forward portion of said cab means.

13. An apparatus according to claim 12 wherein said second duct portion extends through said cab means to said vacuum producing means.

14. An apparatus according to claim 12 wherein said vacuum producing means is mounted between said cab means and said collection box means, said collection box means being movably mounted for dumping.

* * * * *

5

10

15

20

25

30

35

40

45

50

55

60

65

70

75

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,675,267 Dated July 11, 1972

Inventor(s) Vernon L. Klawitter

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

In the Heading, line [22]; --(Under Rule 47)--

has been inserted below "Dec. 15, 1969"

Signed and sealed this 29th day of May 1973.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents