FLOOR SWEEPING APPARATUS

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ABSTRACT

A sweeping apparatus driven by a fuel burning engine, the sweeping mechanism including first and second counter-rotating brushes, the first and lower brush being in contact with the surface to be swept and rotating counter to the direction of travel and the second brush being mounted above and to the rear of the first brush in a direction away from the direction of travel. The apparatus includes housing elements for enclosing the two counter-rotating brushes and a blower driven by the engine for directing suction air, from the surface being swept, upwardly through the two brushes to a filter element disposed immediately above a container for collecting the swept up debris. The finer dust particles are collected by the filter and subsequently drop into the container and the heavier dust particles are guided directly into the container.

6 Claims, 2 Drawing Figures
FLOOR SWEEPING APPARATUS

BACKGROUND AND SUMMARY OF THE DISCLOSURE

This invention relates generally to surface sweeping apparatus and more particularly to an automatic floor sweeper utilizing a combination of counter-rotating sweeper rolls or brushes and a stream of suction air for conveying the extreme-ly fine and coarse debris from the surface to be swept to a container disposed above and to the rear of the immediate sweeping area.

In the case of prior sweeping machines having an automatic pickup, the swept up material is generally picked up either by mechanical means or by entraining the debris in a stream of suction created air. The debris is then conveyed to a collecting container, the inlet of which is a considerable distance above the swept surface. In the case of exclusively mechanically operated brushes for picking up the debris, it has been found that the apparatus is unsatisfactory for picking up fine refuse such as particles of sand or dust because the sand or dust has a tendency to fall through the individual elements of the brush. Thus, the debris falls back into the swept surface due to the sieve-like action of the brushes. Moreover, with apparatus of this type, the operator is subjected to large amounts of dust due to the stirring up of the fine particles and their emergence from the sweeping apparatus without obstruction. Also, in the case of the mechanical sweeping apparatus, heavy and soaked refuse may not reach the collecting container due to the fact that insufficient energy is imparted to the particles by the sweeping brushes.

The dust problem is normally solved by utilizing an apparatus which relies on an air stream principle wherein the debris is entrained in a stream of air and is directed from the swept surface toward the collecting container by means of the mechanically created air stream. However, in this type of machine, it has been found that the heavier particles are not imparted with sufficient energy to be deposited into the collecting container. Rather, the particles are not picked up initially because of the lack of sufficient suction or, on the other hand, do not reach the collecting container due to the pressure drops within the conduit system. In the case of moist or soaked refuse, the air entrained principle does not satisfactorily pick up the heavy particles. Further, in the case of suction operated machines, large pieces of debris, such as paper, may intermittently interrupt the flow of air to the collecting chamber thereby returning entrained, uncollected debris to the swept surface.

With the apparatus of the present invention, the debris sweeping brushes are so devised and housed as to impart additional energy to the particles to carry them up and rearwardly to the collecting container. Also, a suction stream of air is utilized to entrain the debris and impart further energy to the particles, dust and sand particles being collected by a filter apparatus and the heavier particles being directed directly into the collection container, for example the common garbage can of the usual design.

In accordance with one preferred embodiment of the present invention, the ground contacting sweeper roll is set, relative to the direction of travel, ahead of the roll or rolls rotating above it. The cooperation and arrangement of the ground contacting and the superposed rolls in the illustrated manner insures residue free conveyance upward of the sweepings. Furthermore, the relative positioning of the rolls and the dimensioning of the rolls and their housings provides a particular advantageous conveyance of debris from the swept floor to the collecting container. Also, the system provides for precise adjustment of the sweeping mechanism as to the coating of the sweeping roll and the superposed roll to precisely convey swept up debris into the container.

The walls of the shaftlike housing of the rolls are utilized to compress the brushes rotating within the housings to provide a springlike action of the individual portions of the rolls when they are released by the housing to fling the collected debris upwardly, either to be collected by the subsequent superposed rolls or to be flung upwardly and rearwardly toward the collecting container.

Accordingly, it is one object of the present invention to provide an improved surface sweeping apparatus.

Another object of the present invention is to provide an improved sweeping apparatus which has superior debris picking up characteristics.

It is another object of the present invention to provide an improved sweeping apparatus which is capable of collecting moist, heavy, or fine debris from a surface.

It is still another object of the present invention to provide an improved sweeping apparatus utilizing rotating brushes, the brushes being devised to impart energy to the debris to fling the debris upwardly and to the rear.

It is still another object of the present invention to provide an improved sweeping apparatus which utilizes a combination of mechanical and pneumatic debris conveying apparatus.

It is still a further object of the present invention to provide an improved housing configuration for the brushes of a sweeping apparatus.

It is still another object of the present invention to provide an improved sweeping apparatus wherein certain portions of two brushes are aligned in a preselected manner to facilitate conveying the debris upwardly and to the rear.

It is still a further object of the present invention to provide an improved sweeping apparatus wherein the finer debris particles are separated from the heavier debris particles above the collecting brushes.

It is still a further object of the present invention to provide an improved sweeping apparatus which minimizes dust on the exterior of the machine.

It is still a further object of the present invention to provide an improved sweeping apparatus which is versatile in the types of debris capable of being swept up and is reliable in use.

Other objects and advantages of the present invention will become readily apparent from a consideration of the following specifications, claims and drawings wherein:

FIG. 1 is a side view, partially in cross section of a sweeping apparatus incorporating the features of the present invention; and

FIG. 2 is an enlarged view of the details of the brush, filter and collecting container assembly of FIG. 1.

Referring now to the drawings, and particularly to FIG. 1 thereof, there is illustrated a sweeping vehicle 1 which is adapted to be driven by a plurality of drive wheels 2, the rear of machine 1 being supported by a plurality of steerable wheels 3. The steerable wheels are controlled by means of the illustrated steering wheel. The machine includes a superstructure 4 which supports a power unit 5, in the illustrated embodiment a fuel burning engine of the type common in the art.

The output from the fuel burning engine 5 is derived from a transmission 6 and a belt drive 7, the belt drive 7 being utilized to supply power to a drive assembly or transmission 8. The power for the wheels 2 is derived from the drive assembly 8 and the drive 8 is also utilized to provide power for a pair of brush rolls 9 and 10 through a belt drive similar to that described above. The speed of either or both rolls may be controlled by the operator. The operation of the drive assembly 8 is controlled through a shift lever 11 as is common in the art. The two brush rolls 9 and 10 are surrounded by and closely confined by a housing assembly 12, 13 and 14, the walls of which are made entirely or in part of flexible material or sheet metal.

The walls 12, 13 and 14 of the housing snugly enclose the two rolls 9 and 10, and particularly are of a lesser diameter than the diameter of the rolls 9 and 10. In this way, the individual strands of the brushes 9 and 10 are bent slightly away from the direction of travel for a purpose to be hereinafter explained. It will be noted that the configuration of the rolls and housing provides a debris passage directed substantially upwardly and to the rear to carry the debris being swept from the surface through the debris passageway formed in the housing 12, 13 and 14. The elastic deformation of the individual
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3 strands of the brush, when moving over the wall parts 13 and 14, create potential energy in the brush strands which is utilized, when the strands are freed in an open space to be hereinafter described, to impart a flinging motion to the debris in an upward and rearward direction.

The area between the housing 13 and 14 is formed with a tongue like sharp edge 17, two locations for the edge 17 being indicated, and the housing 12 is formed with an indented portion 28 to form an opening 18 between the space in which the lower roll turns and the space provided for the upper shaft and the roll 10. This space is kept narrow enough to approximately correspond to the breadth of the free spaces between the sweeping means segments 15 and the segments 16.

The housing elements 13 and 14 are also provided with break away edges 19 and 20 and these edges are utilized to effect a flinging off of the bits of dirt conveyed by the sweeping means 15 and 16 due to the elastic deformation of the individual strands of the brushes and a subsequent sudden decompression of the strands as the sweeping elements 15 and 16 lift away from the walls of housing 13 and 14. The edge 19 may take either position shown. The sweepings are flung through the opening 18 between the sweeping segments 16 of the second rotating roll 10 to be collected thereby and conveyed upwardly toward an aperture 21. It will be noted that the individual elements 16 are also elastically deformed to provide the potential energy for the flinging action described above. The upper housing 14, in association with the edge 20, will also effect a flinging off of the conveyed bits of dirt through the shaft outlet 21 of the housing to the collecting container 22 fastened to the end of the vehicle by means of a bracket 23. In the illustrated embodiment, the collecting container 22 is illustrated as a common garbage can. The rear of the vehicle 1 is enclosed by means of a flap element 24 to minimize dust being thrown to the rear of the vehicle.

The vehicle 1 is also provided with a blower assembly 29 including a pulley or driven element 30, which driven element is connected to the transmission 6 by means of a belt. The blower is communicated with a filter assembly 26 by means of a passageway 25, the blower creating a suction or reduced pressure area within the passageway 25. The reduced pressure in the passageway 25 is communicated to the filter assembly 26 and thence to the surface to be swept through the passageway created in the housing assemblies 12, 13 and 14, and the brush assemblies 9 and 10 to create a continuous flow of air from the surface being swept to the filter assembly 26. The continuous flow of air entrains the particles being swept from the swept surface through the brushes to the filter assembly. The heavier particles conveyed by the brushes 9 and 10 are flung generally directly into the collecting container 22 and the lighter, finer particles are collected at the filter assembly 26. Thus, a separation of particles by size and weight is affected directly in the area of the filter assembly 26. When the particles on the filter become sufficiently coherent and heavy, they will fall into the collecting container 22.

While it will be apparent that the preferred embodiment of the invention disclosed is well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. A sweeping machine for automatically picking up sweepings from a floor, having a rotating sweeping roll positioned adjacent the floor, means for rotating the sweeping roll counter to the direction of travel of the sweeping machine, and a collecting container positioned on the machine to form a collecting receptacle for the picked-up sweepings, the improvement comprising a housing assembly having a first housing including an outlet directed toward the collecting container for projecting the sweepings rearwardly toward the container and in which the roll is mounted for rotation, blower means mounted in fluid communication with the interior of the first housing of producing a stream of air directed generally toward the collecting container from the floor through the housing assembly, said first housing having a front and rear portion positioned closely adjacent the floor for forming constricted air flow passages for said stream of air, a second roll mounted contiguous with, above and generally rearwardly of said first roll and contained within said housing assembly, said second roll rotating in the direction of travel counter to the direction of travel for collecting the sweepings from the first roll and directing the sweepings toward the collecting container, said housing assembly including a second housing having an inlet supported adjacent said outlet for enclosing said second roll, said stream of air being directed from said first housing through said second housing to a second housing outlet, said first and second housings closely fitting the outer edge of said rolls and being of a lesser diameter than said rolls for a substantial portion of the circumference thereof, said rolls being mounted at the center point of the respective housing for the said roll, and filter means positioned above the container and interposed between the blower means and the floor for collecting sweepings entrained in the stream and dropping the entrained sweepings.

2. The improvement of claim 1 wherein the stream of air created by said blower feeds kinetic energy to said sweepings for precluding lighter sweepings from dropping through said first and second rolls.

3. The improvement of claim 2 wherein said filter means collects a layer of sweepings, the sweeping layer falling into the collecting container when the layer becomes sufficiently heavy to be nonsupporting.

4. The improvement of claim 1 wherein said first and second housings are generally cylindrical.

5. The improvement of claim 4 wherein said first and second housings includes slot-like openings formed by a ridge adjacent the outlet of said housing, the portion of said rolls entering said slot-like openings imparting a flinging action to said collected sweepings.

6. The improvement of claim 1 wherein said first and second housings include slot-like openings formed by a ridge adjacent the outlet of said housings, the portion of said rolls entering said slot-like openings imparting a flinging action to said collected sweepings. ** * * * *