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(54) **Title**: DEBRIS SHREDDING PICK-UP HEAD SYSTEM

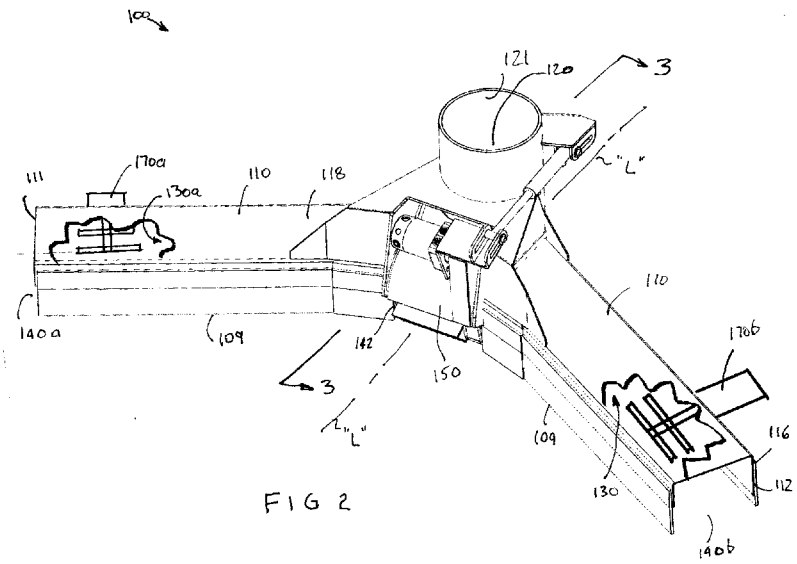


FIG 2

(57) **Abstract**: A debris shredding pick-up head system for use with a surface cleaning vehicle comprises a housing having an interior and a suctioning bottom opening in fluid communication and debris transfer relation to the interior, and defining a fore-aft axis. There is a debris receiving inlet in the housing for receiving debris to be shredded into the housing, and a debris outlet in the housing for permitting debris to egress from the housing. A debris path connects together in fluid communication the debris receiving inlet and the debris outlet. A debris shredder is operatively mounted in the housing for shredding debris within the interior of the housing, to thereby produce shredded debris to egress from the housing through the debris outlet.

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DEBRIS SHREDDING PICK-UP HEAD SYSTEM

RELATED APPLICATIONS

[0001] This application is a non-provisional application claiming priority from United States Provisional Patent Application Serial No. 61/496,410 filed on June 13, 2011, which is herein incorporated by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to pick-up head systems for factory, sidewalk and street sweepers, and more particularly to such dustless pick-up head systems that have a contained debris shredder.

[0003] Prior art pick-up heads do not fully seal to the ground and allow material to readily enter the front of the pick-up head. Material enters the pick-up head by way of pushing back the pliable front flap that runs along the front, or by way of an opening to permit passage of debris into the housing. This readily presents the opportunity for dust and other fine particulate matter to escape from the housing in re-circulating air units.

[0004] Furthermore, the pliable front flaps on conventional pick-up heads allow for a temporary loss of suction power within the width of the pick-up head as debris enters. This causes the suction port to reject internal re-circulating airflow while it is receiving air from the atmosphere and material is subsequently left behind which is highly undesirable.

[0005] Larger debris, such as twigs or the like, are often encountered in addition to smaller debris, such as gravel or the like, in the sweeping application. Larger debris and sticks can clog the suction port decreasing air speed in the housing and causing material to be left behind. The complete plugging up of vacuum sweepers from debris is quite common in heavy litter, leaves (sticks), etc. and is a downtime operational issue. Further, large debris can cause the pliable front flap in re-circulating air units to remain in temporarily open position which causes a pressure decrease and also leads to leaving material behind. Both of these circumstances are not desirable.

[0006] It is known in prior art to incorporate debris access points in pick-up heads which can be controlled from the operator's seat in order to allow access for large accumulations of litter, leaves, etc. This, however, is meant to be temporary to avoid continuous loss of suction pressure within the vacuum chamber, and this large debris can clog the vacuum hose and drop performance or completely stop operation.

[0007] It is an object of the present invention to provide a debris shredding pick-up head system.

[0008] It is another object of the present invention to provide a debris shredding pick-up head system wherein at least one debris shredder is disposed within the housing of the pick-up head.

[0009] It is another object of the present invention to provide a debris shredding pick-up head system which does not allow the opportunity for larger debris such as twigs or the like to clog the internal suction port and stop or impede the sweeper's efficiency.

[00010] It is another object of the present invention to provide a debris shredding pick-up head system wherein the front face of the pick-up head is in sealing relation to the ground thereby precluding the entry of debris.

[00011] It is another object of the present invention to provide a debris shredding pick-up head system that can digest large accumulations of debris, litter and leaves without greatly reducing vehicle travel speed.

[00012] It is another object of the present invention to provide a debris shredding pick-up head system that allows the continuous entry of debris while precluding any loss of suction pressure within the entire width of the pick-up head.

[00013] It is another object of the present invention to provide a debris shredding pick-up head system that precludes dust and other fine particulate matter from escaping the pick-up head housing.

[00014] It is another object of the present invention to provide a debris shredding pick-up head system that operates its shredding components inside the pick-up head for operator safety.

[00015] It is another object of the present invention to provide a debris shredding pick-up head system that is more efficient allowing either a faster effective sweeping speed or a reduction of energy, thus fuel, to perform the same job.

SUMMARY OF THE INVENTION

[00016] In accordance with one aspect of the present invention there is disclosed a novel debris shredding pick-up head system for use with a surface cleaning vehicle. The debris shredding pick-up head system comprises a housing having an interior and a suctioning bottom opening in fluid communication and debris transfer relation to the interior, and defining a fore-aft axis; a debris receiving inlet in the housing for receiving debris to be shredded

into housing; a debris outlet in the housing for permitting debris to egress from the housing; a debris path in the housing connecting together in fluid communication the debris receiving inlet and the debris outlet; and a debris shredder operatively mounted in the housing for shredding debris within the interior of the housing, to thereby produce shredded debris to egress from the housing through the debris outlet.

[00017] Other advantages, features and characteristics of the present invention, as well as methods of operation and functions of the related elements of the structure, and the combination of parts and economies of manufacture, will become more apparent upon consideration of the following detailed description and the appended claims with reference to the accompanying drawings, the latter of which is briefly described herein below.

BRIEF DESCRIPTION OF THE DRAWINGS

[00018] The novel features which are believed to be characteristic of the debris shredding pick-up head system according to the present invention, as to its structure, organization, use and method of operation, together with further objectives and advantages thereof, will be better understood from the following drawings in which a presently preferred embodiment of the invention will now be illustrated by way of example. It is expressly understood, however, that the drawings are for the purpose of illustration and description only, and are not intended as a definition of the limits of the invention. In the accompanying drawings:

[00019] **Figure 1** is a side elevational view of the preferred embodiment of the debris shredding pick-up head system according to the present invention mounted on a surface cleaning vehicle;

[00020] **Figure 2** is a partially cut-away perspective view of the preferred embodiment dustless pick-up head system of Figure 1; and,

[00021] **Figure 3** is an enlarged sectional side elevational view of the preferred embodiment dustless pick-up head system of Figure 1, taken along section line 3-3 of Figure 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[00022] Reference will now be made to Figures 1 through 3, which show a preferred embodiment of the debris shredding pick-up head system of the present invention, as indicated by general reference numeral 100. The dustless pick-up head system 100 is for use with a surface cleaning vehicle 102 for removing dust (including fine particulate matter) and debris (including bottles, cans, leaves, dirt, and so on) from a surface to be cleaned 104.

[00023] The preferred embodiment dustless pick-up head system 100 basically comprises a housing 110, a debris outlet 120, debris path 130, a debris receiving inlet 142, a substantially sealed door apparatus 150, and a debris shredder 170. The dustless pick-up head system 100, particularly the housing 110, define a generally central fore-aft longitudinal axis "L".

[00024] The dustless pick-up head system 100 comprises a housing 110 extending between and first end 111 and a second end 112, and having a substantially hollow interior 119 and a suctioning bottom opening 114 defined by a bottom peripheral edge 109. The suctioning bottom opening 114 is in fluid communication and debris transfer relation with the substantially hollow interior 119 of the housing 110. There is also a first debris suctioning inlet 140a disposed at the first end 111 of the housing 110 and a second debris suctioning inlet 140b disposed at the second end 112 of the housing 110.

[00025] Further, the housing 110 has a front wall 115, a back wall 116, interconnected by a roof portion 118. Dust and fine particulate on the surface to be cleaned 104 pass under the front peripheral edge 109 and are suctioned into the substantially hollow interior 119 of the housing 110. The front wall 115 also precludes the passage of larger debris, such as stones, bottles, cans, leaves, sticks and the like, from passing under the bottom peripheral edge 109 of the front wall 115 as the housing 100 and moves along the surface to be cleaned 104. housing 110.

[00026] The housing 110 further comprises a debris receiving main inlet 142 in the front wall 115 in debris receiving relation with respect to a surface to be cleaned 104, for receiving debris to the housing 110. The door apparatus 150 is operatively mounted at said debris receiving main inlet 142. The door apparatus 150 preferably comprises a substantially sealed door apparatus that itself comprises a rotatable door assembly 146 defining a substantially horizontally oriented central pivot axis "P" and an outer periphery 147, and a seal 190 operatively disposed in sealing relation between the rotatable door assembly 146 and the housing 110. The front wall 115 directs debris, such as bottles, sticks, etc. along the housing 110 to the debris receiving front inlet 142 at the substantially sealed door apparatus 150.

[00027] The debris receiving inlet 142 is disposed in the housing 110 for receiving debris to be shredded into the housing 110. The debris receiving inlet 142 is disposed in the front wall 115 of the housing 110 in order to receive debris as the surface cleaning vehicle 102 moves forwardly.

[00028] The debris outlet 120 in the housing 110 is for permitting debris to egress from the housing 110.

The debris outlet 120 is connected in air flow delivery relation through a delivery duct 121 to a hopper (not specifically shown) for permitting shredded debris to egress from the housing 110 into the hopper.

[00029] The debris path 130 in the housing 110 is for connecting together in fluid communication the debris receiving inlet 142 and the debris outlet 120.

[00030] The debris shredder 170 is operatively mounted in the housing 110 for shredding debris within the interior 119 of the housing 110, to thereby produce shredded debris to egress from the housing 110 through the debris outlet 120. The debris shredder 170 is operatively mounted in the housing 110 adjacent the debris receiving inlet 142, preferably immediately rearwardly of the debris receiving inlet 142, and immediately forwardly of the debris outlet 120.

[00031] The debris shredder 170 comprises at least one blade, an in the preferred embodiment, as illustrated, a plurality of blades 172 mounted on a driveshaft 174 that is rotatable about a shredder axis "S", and a drive motor 176 that is operatively connected in driving relation to the driveshaft 174.

[00032] As can be readily seen in Figure 3, the drive motor 176 is disposed outside the debris path 130, and more specifically is disposed generally rearwardly of the housing 100. The debris outlet 120 is disposed immediately above at least a portion of the plurality of blades of the shredder, and as illustrated, is disposed immediately above the plurality of blades 172 of the shredder 170. In order to accommodate this specific arrangement, the shredder axis "S" is oriented generally horizontally and forwardly.

[00033] As further can be seen in the Figures, the debris shredder 170 is a primary debris shredder, and further comprising a first auxiliary debris shredder 170a disposed between the first end 111 of the housing 110 and the debris outlet 120, and a second auxiliary debris shredder 170b disposed between the second end 112 of the housing 110 and the debris outlet 120. More specifically, the first auxiliary debris shredder 170a is disposed adjacent the first end 111 of the housing 110 and the second auxiliary debris shredder 170b is disposed adjacent the second end 112 of the housing 110. The first auxiliary debris shredder 170a is for shredding debris that enters the substantially hollow interior 119 of the housing 110 through the first debris suctioning inlet 140a. Similarly, the second auxiliary debris shredder 170b is for shredding debris that enters the substantially hollow interior 119 of the housing 110 through the second debris suctioning inlet 140b.

[00034] In use, as the mobile surface cleaning vehicle 102 travels forwardly, dust and debris on the surface to be cleaned 104 are encountered by the debris shredding pick-up head 100. Any debris that is encountered by the left and right front walls 115 of housing 110 will be moved to the debris receiving front inlet 142, due to slope of the

"V"-shaped front walls 115 of the housing 110. The debris will enter the substantially hollow interior 119 of the housing 110 through the debris receiving front inlet 142, through the substantially sealed door apparatus 150, where the debris encounters the primary debris shredder 170. Furthermore, debris that enters the substantially hollow interior 119 of the housing 110 through the first debris suctioning inlet 140a encounters the first auxiliary debris shredder 170a. Also, debris that enters the substantially hollow interior 119 of the housing 110 through the second debris suctioning inlet 140b encounters the second auxiliary debris shredder 170b.

[00035] Dust and shredded debris in the substantially hollow interior 119 of the housing 110 are suctioned out of the housing 110 through the debris outlet 120 and the duct 121, and into the hopper (not specifically shown), by a source of suction, such as the main fan (not specifically shown).

[00036] As can be understood from the above description and from the accompanying drawings, the present invention provides a debris shredding pick-up head system wherein at least one debris shredder is disposed within the housing of the pick-up head, which does not allow the opportunity for larger debris such as twigs or the like to clog the internal suction port and stop or impede the sweeper's efficiency, that operates its shredding components inside the pick-up head for operator safety and that allows the continuous entry of debris while precluding any loss of suction pressure within the entire width of the pick-up head all of which features are unknown in the prior art.

[00037] Other variations of the above principles will be apparent to those who are knowledgeable in the field of the invention, and such variations are considered to be within the scope of the present invention. Further, other modifications and alterations may be used in the design and manufacture of the dustless pick-up head system of the present invention without departing from the spirit and scope of the accompanying claims.

I CLAIM:

1. A debris shredding pick-up head system for use with a surface cleaning vehicle, for suctioning debris from a surface to be cleaned, wherein the pick-up head of the pick-up head system is substantially sealed to the surface to be cleaned during use, said debris shredding pick-up head system comprising:

a housing having an interior, and a suctioning bottom opening in fluid communication and debris transfer relation to said interior, and defining a fore-aft axis;

a debris receiving inlet in said housing for receiving debris to be shredded into said housing;

a debris outlet in said housing for permitting debris to egress from said housing;

a debris path in said housing connecting together in fluid communication said debris receiving inlet and said debris outlet;

a debris shredder operatively mounted in said housing for shredding debris within the interior of said housing, to thereby produce shredded debris to egress from said housing through said debris outlet.

2. The debris shredding pick-up head system of claim 1, wherein said debris shredder is operatively mounted in said housing adjacent said debris receiving inlet.

3. The debris shredding pick-up head system of claim 2, wherein said housing has a front wall, and wherein said debris receiving inlet is disposed in the front wall of said housing.

4. The debris shredding pick-up head system of claim 3, wherein said debris shredder is operatively mounted in said housing immediately rearwardly of said debris receiving inlet.

5. The debris shredding pick-up head system of claim 4, wherein said debris shredder is operatively mounted in said housing immediately forwardly of said debris outlet.

6. The debris shredding pick-up head system of claim 5, wherein said debris shredder comprises at least one blade mounted on a driveshaft that is rotatable about a shredder axis, and a drive motor operatively connected in driving relation to said driveshaft.

7. The debris shredding pick-up head system of claim 6, wherein said shredder axis is oriented generally horizontally and forwardly.

8. The debris shredding pick-up head system of claim 7, wherein said drive motor is disposed outside said debris path.

9. The debris shredding pick-up head system of claim 6, wherein said drive motor is disposed generally rearwardly of said housing.

10. The debris shredding pick-up head system of claim 6, wherein said debris outlet is disposed immediately above said plurality of blades of said shredder.

11. The debris shredding pick-up head system of claim 6, wherein said debris outlet is disposed immediately above at least a portion of said plurality of blades of said shredder.

12. The debris shredding pick-up head system of claim 5, wherein said housing has a first end and a second end, and wherein said debris shredder is a primary debris shredder, and further comprising a first auxiliary debris shredder disposed between said first end of said housing and said debris outlet, and a second auxiliary debris shredder disposed between said second end of said housing and said debris outlet.

13. The debris shredding pick-up head system of claim 12, wherein said first auxiliary debris shredder is disposed adjacent the first end of said housing and said second auxiliary debris shredder is disposed adjacent the second end of said housing.

14. The pick-up head system of claim 1, wherein said housing has a front wall, and further comprising a debris receiving main inlet in said front wall of said housing in debris receiving relation with respect to a surface to be cleaned, for receiving debris to said housing, and a door apparatus operatively mounted at said debris receiving main inlet.

15. The pick-up head system of claim 14, wherein said door apparatus comprises a substantially sealed door apparatus.

16. The pick-up head system of claim 15, wherein said substantially sealed door apparatus comprises a rotatable door assembly defining a substantially horizontally oriented central pivot axis and an outer periphery, and a sealing operatively disposed in sealing relation between said rotatable door assembly and said housing.

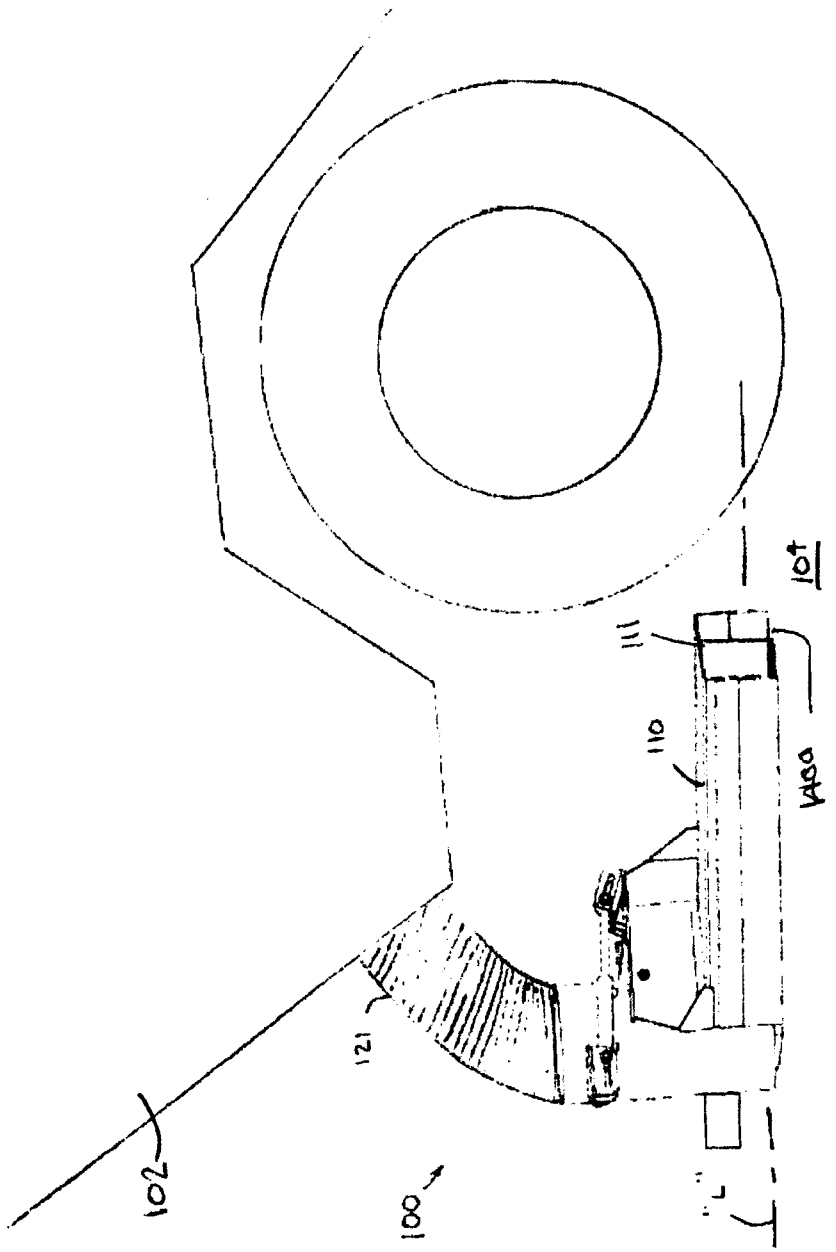


FIG 1

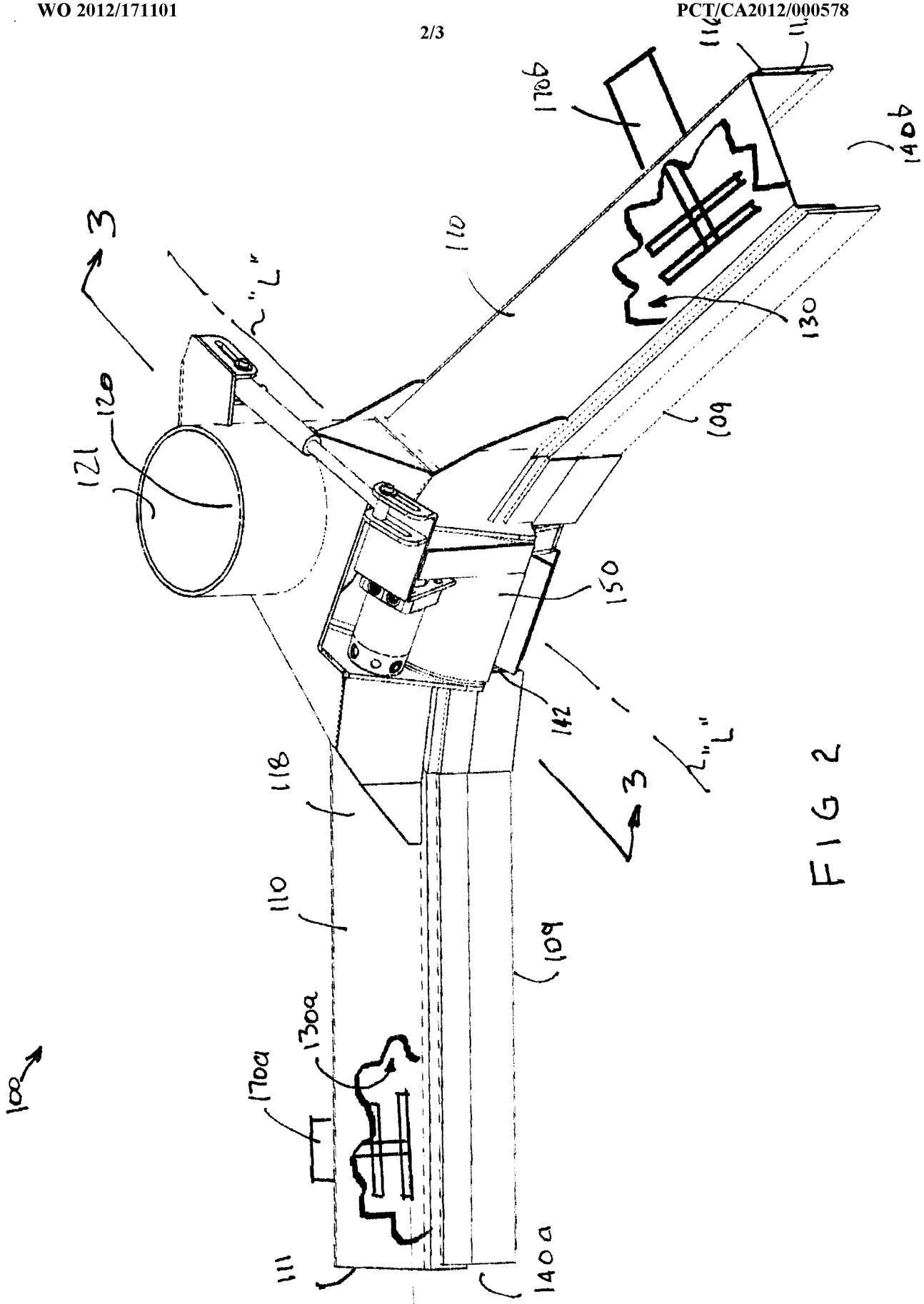
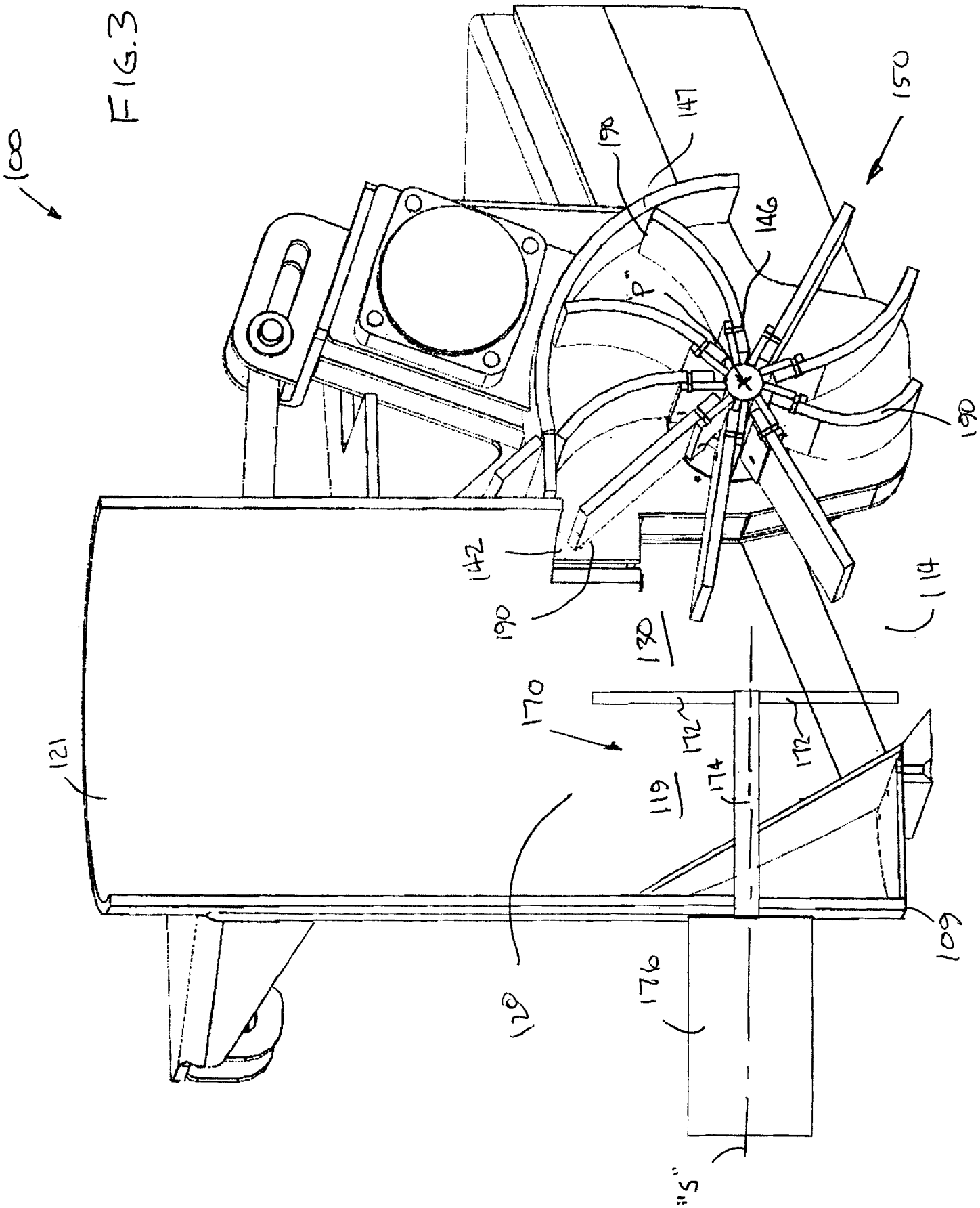

100
3
"L"
120
121
110
130
109
150
142
118
170a
130a
111
140a
140b
170b
114

FIG 2

FIG.3


100
150
147
198
146
"d"
190
142
90
120
114
170
172
174
176
178
611
121
109
"S"

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2012/000578

A. CLASSIFICATION OF SUBJECT MATTER

IPC: ***E01H 1/08*** (2006.01) , ***A01G 1/12*** (2006.01) , ***A47L 11/24*** (2006.01) , ***A47L 7/02*** (2006.01) , ***B02C 18/06*** (2006.01) , ***E01H 15/00*** (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC : E01H 1/08, 15/00; A01G 1/12; A47L 11/24, 7/02; B02C 18/00/LOW

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)

DATABASES : EPODOC (via EPOQUE), Canadian Patent Database

KEYWORDS : shred+ or cut+ or dic+ or pulver+ or chop+ or grind+, surface or road of floor, sweep+ or vac+ or clean+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X Y	DE 73 28 581 U (WIEDENMANN GMBH) 01 December 1977 (01-12-1977) * see whole document	1, 2 3-11, 14-16
Y	US 2001/029642 A1 (FIRDAUS et al.) 18 October 2001 (18-10-2001) * see whole document	3-11, 14-16
Y	DE 41 24 682 A1 (GUTMANN et al.) 28 January 1993 (28-01-1993) * see whole document	10, 11
A	US 2003/204932 A1 (HILE) 06 November 2003 (06-11-2003) * see whole document	1-16
A	US 5,784,756 A (SLOCUM et al.) 28 July 1998 (28-07-1998) * see whole document	1-16

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
06 September 2012 (06-09-2012)	26 September 2012 (26-09-2012)

Name and mailing address of the ISA/CA	Authorized officer
Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001-819-953-2476	Casey Thomas (819) 934-3417

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 5,287,684 A (BEROTH) 22 February 1994 (22-02-1994) * see whole document	1-16

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2012/000578

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US2538643A	16 January 1951 (16-01-1951)	None	
US5287684A	22 February 1994 (22-02-1994)	None	