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

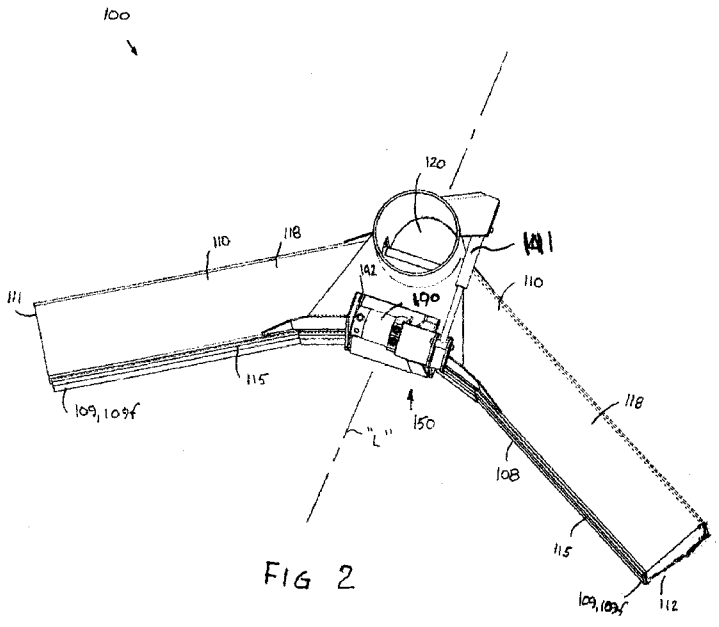


FIG 2

(57) **Abstract**: A pick-up head system for use with a surface cleaning vehicle comprises a housing having a suctioning bottom opening open in fluid communication and debris transfer relation to the interior. A debris receiving main inlet is disposed in the front wall of the housing, in debris transfer relation for receiving debris to the housing. A substantially sealed continuous-debris-passing door apparatus is operatively mounted on the housing at the debris receiving main inlet in vertically movable relation for movement between a substantially sealed surface engaging position whereat the substantially sealed continuous-debris-passing door apparatus extends upwardly from the level of the bottom peripheral edge of the housing, and a raised position whereat the substantially sealed continuous-debris-passing door apparatus is raised above the substantially sealed surface engaging position; and a debris outlet in the housing open in fluid communication and debris transfer relation to the substantially hollow interior of the housing.

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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 surface cleaning vehicles, and more particularly to dustless pick-up head systems for surface cleaning vehicles

BACKGROUND OF THE INVENTION

[0003] Prior art pick-up heads do not completely seal to the ground in a manner which allows 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.

[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 airflow while it is receiving air from the atmosphere and material is subsequently left behind which is highly undesirable.

[0005] 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 is meant to be temporary to avoid continuous loss of suction pressure within the vacuum chamber.

[0006] It is an object of the present invention to provide a dustless pick-up head system.

[0007] It is another object of the present invention to provide a dustless pick-up head wherein the front face of the pick-up head is in sealing relation to the ground thereby precluding the entry of debris.

[0008] It is another object of the present invention to provide a dustless pick-up head with a centrally disposed, sealed debris port.

[0009] It is another object of the present invention to provide a dustless pick-up head that allows for the digestion of material relative to the direction of travel.

[00010] It is another object of the present invention to provide a dustless pick-up head that can digest large accumulations of debris, litter and leaves without greatly reducing vehicle travel speed.

[00011] It is another object of the present invention to provide a dustless pick-up head that allows the continuous entry of debris while precluding any loss of suction pressure within the entire width of the pick-up head.

[00012] It is another object of the present invention to provide a dustless pick-up head that precludes dust and other fine particulate matter from escaping the pick-up head housing.

[00013] It is another object of the present invention to provide a dustless pick-up head that is more efficient thereby allowing either a faster effective sweeping speed or a reduction of energy, thus fuel, to perform the same job.

SUMMARY OF THE INVENTION

[00014] In accordance with one aspect of the present invention there is disclosed a novel pick-up head system for use with a surface cleaning vehicle having a fore-aft axis of travel. The dustless pick-up head system comprises a housing having a front wall, an interior and a suctioning bottom opening defined by a bottom peripheral edge and open in fluid communication and debris transfer relation to the interior, and defining a fore-aft axis; a debris receiving main inlet in the front wall of the housing, in debris transfer relation to the interior of the housing for receiving debris to the housing; a substantially sealed continuous-debris-passing door apparatus operatively mounted on the housing at the debris receiving main inlet in vertically movable relation for movement between a substantially sealed surface engaging position whereat the substantially sealed continuous-debris-passing door apparatus extends upwardly from the level of the bottom peripheral edge of the housing, and a raised position whereat the substantially sealed continuous-debris-passing door apparatus is raised above the substantially sealed surface engaging position; and a debris outlet in the housing open in fluid communication and debris transfer relation to the substantially hollow interior of the housing.

[00015] 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

[00016] The novel features which are believed to be characteristic of the dustless 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:

[00017] **Figure 1** is a side elevational view of the preferred embodiment of the dustless pick-up head system according to the present invention mounted on a surface cleaning vehicle;

[00018] **Figure 2** is a top plan view of the preferred embodiment dustless pick-up head system of Figure 1;

[00019] **Figure 3** is a front elevational view of the preferred embodiment dustless pick-up head system of Figure 1;

[00020] **Figure 4** is a left corner elevational view of the preferred embodiment dustless pick-up head system of Figure 1;

[00021] **Figure 5** is a side perspective view from underneath of the preferred embodiment dustless pick-up head system of Figure 1;

[00022] **Figure 6** is an enlarged sectional side elevational view of the preferred embodiment dustless pick-up head system of Figure 1;

[00023] **Figure 7** is an enlarged sectional side elevational view of the preferred embodiment dustless pick-up head system of Figure 1, with the raisable and lowerable sealed door assembly is in a raised position; and,

[00024] **Figure 8** is a front perspective view from the right side of the preferred embodiment dustless pick-up head system of Figure 1, with the raisable and lowerable sealed door assembly is in a raised position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[00025] Reference will now be made to Figures 1 through 8, which show a preferred embodiment of the dustless 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.

[00026] The preferred embodiment dustless pick-up head system 100 is for use with a surface cleaning vehicle 102 for cleaning a surface to be cleaned 104 and basically comprises a housing 110, substantially rigid skirt 108, a debris outlet 120, debris passage 130, and a substantially sealed continuous-debris passing door apparatus 150 operatively mounted on the housing 110. The dustless pick-up head system 100, particularly the housing 110, define a generally central fore-aft longitudinal axis "L".

[00027] More specifically, 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 suctioning bottom opening 114 defined by a bottom peripheral edge 109. Further, the housing 110 has a front wall portion 115, a back wall portion 116, interconnected by a roof portion 118. Dust and fine particulate on the surface to be cleaned 104 pass under the front peripheral edge portion 109f and are suctioned into the substantially hollow interior 119 of the housing 110.

[00028] The substantially rigid skirt 108 is disposed at the bottom peripheral edge 109 of the housing 110 for interfacing the housing 110 in substantially sealed relation with the surface to be cleaned 104 as the surface cleaning vehicle 102 moves along the surface to be cleaned 104. The substantially rigid skirt 108 is for interfacing the housing 110 in substantially sealed relation with the surface to be cleaned 104 as the surface cleaning vehicle 102 moves along the surface to be cleaned 104. The substantially rigid skirt 108 precludes the passage of almost all air (and contaminants therein, such as dust and other fine particulate matter and the like) from escaping out of the housing 110 in the event that a section of the housing 110 has a higher air pressure than the ambient surroundings, which can occur with recirculating air type pick-up head systems, if the seal with the surface to be cleaned is not present. A very small portion of air is suctioned between the substantially rigid skirt 108 and the surface to be cleaned 104 to preclude any dust and other fine particulate matter and the like from escaping from the housing 110, and also to suction in dust and other fine particulate matter and the like under the substantially rigid skirt 108 at the

front wall portion 115, which may be created as the substantially rigid skirt 108 at the front wall portion 115 engages the surface to be cleaned 104.

[00029] Further, the substantially rigid skirt 108 precludes the passage of larger debris, such as stones, bottles, cans, leaves, and the like, from passing under the front wall portion 115 as the housing 100 and moves along the surface to be cleaned 104. Instead, the substantially rigid skirt 108 directs small debris, such as gravel, along the housing 110 to the debris receiving main inlet 142 at the sealed continuous-debris-passing door apparatus 150. The front wall portion 115 of the housing directs larger debris to the debris receiving main inlet 142 at sealed continuous-debris-passing door apparatus 150 due to the right-to-left rearward slant of the housing 110.

[00030] A debris outlet 120 is disposed in the housing 110 for permitting dust and debris to egress from the housing 110 into a hopper. The debris outlet 120 is disposed towards the back wall portion 116 of the housing 110 generally centrally disposed between the first end 111 and the second end 112. The debris outlet 120 is connected in air flow delivery relation through a delivery duct 121 to a hopper for permitting dust and debris to egress from the housing 110 into the hopper.

[00031] As can be readily seen in the figures, the substantially sealed continuous-debris-passing door apparatus 150 operatively mounted on the housing 110 at the debris receiving main inlet 142 in vertically movable relation for movement between a lowered surface engaging position, as best seen in Figures 1 through 6 and a raised debris passing position, as best seen in Figures 7 and 8. The substantially sealed continuous-debris-passing door apparatus 150 comprises a rotatable door assembly 146, the door frame 145, the seal 147, and the selectively operable actuation means 190, that is mounted in hinged relation on the housing 110 by a suitable sealed hinge 143. Alternatively, any other suitable means could be used, such as a pair of left and right opposed pins engaged in co-operating ball bearing mechanisms. Additionally or alternatively, a pliable material, possibly in bellows form, could be used to maintain a seal between the door frame 145 and the housing 110, as necessary.

[00032] The rotatable door assembly 146 has at least a first door portion and a second door portion joined together at a central pivot axis "P", and operatively mounted at the central pivot axis "P" in rotatable relation on the door frame 145. A seal 147, which is preferably made from rubber, is operatively disposed between the rotatable door assembly 146 and the door frame 145 for sealing the rotatable door assembly 146 with respect to the door frame 145, to thereby substantially preclude air from ingressing into the interior 119 of the housing 110 through the debris receiving main inlet 142 and to thereby substantially preclude the egress of debris from the interior 119 of the housing 110, as the rotatable door assembly 146 rotates to permit debris to enter the interior 119 of the housing 110.

[00033] The housing further comprises a first side wall 145a and a second side wall 145b disposed on

opposite sides of the debris receiving main inlet 142. The first side wall 145a and a second side wall 145b are each made from a low friction material, such as ultra-high molecular weight (UHMW) polyethylene. The outer periphery of the door frame 145 preferably engages the first side wall 145a and a second side wall 145b in sliding contact. Accordingly, virtually no gap exists between the outer periphery of the door frame 145 and the first side wall 145a and a second side wall 145b, thereby precluding air from escaping from the interior 119 of the housing 110 into the ambient surroundings.

[00034] The sealed door assembly 150 is disposed immediately forwardly of the delivery duct 121. The sealed door assembly 150 is moved between its lowered position and its raised position by means of a hydraulic cylinder 141 that is operatively interconnected between a mounting bracket 144b at the top of the sealed door assembly 150 and a mounting bracket 121b extending outwardly from the delivery duct 121.

[00035] The hydraulic drive motor 190 is mounted on the top of the rotatable door assembly 150 via a chain drive 144c. The chain drive 144c is covered by a small generally vertically oriented housing 144h in order to generally preclude dust and other contaminants from reaching the chain drive 144c, and also to preclude the escape of air and dust from the housing 110.

[00036] A rubber gasket type of material, or the like, is disposed at one or both of the sealed door assembly 150 and the opening of the debris receiving main inlet 142 of the housing 110, in order to provide a seal between the sealed door assembly 150 and the housing 110 when the sealed door assembly 150 is in its lowered surface engaging position.

[00037] Alternatively, the sealed door assembly 150 could be mounted in vertically sliding relation on the housing 110 by means of a plurality of parallel rails that are oriented either generally vertically, or even at an angle to vertically.

[00038] In the lowered surface engaging position, the rotatable door assembly 146 would engage the surface to be cleaned as described above. In the raised debris passing position, the rotatable door assembly 146 would be disposed in spaced relation from the surface to be cleaned, thereby allowing large debris to readily enter the housing 110, such as debris that might be too large to fit through the door frame 145 with the rotatable door assembly 146 in normal operation, or excessive amounts of large debris that need to be permitted into the housing quickly. In order to minimize the amount of time that the housing 110 might not be in a reduced air pressure situation, air cylinders could be used to quickly move the rotatable door assembly 146, the door frame 145, the sealing means 147, and the selectively operable actuation means 190 between the lowered surface engaging position and the raised debris passing position.

[00039] In use, when the surface cleaning vehicle 102 is travelling along a surface to be cleaned 104, it is common to encounter a situation wherein large debris has difficulty entering the interior 119 of the housing 110 through the debris receiving main inlet 142. In this case, the sealed door assembly 150 is moved by the hydraulic cylinder 141 from its substantially sealed surface engaging position to its raised position. Once the large debris has passed through the debris receiving main inlet 142, under the rotatable door assembly 146, the hydraulic cylinder 141 lowers the sealed door assembly 150 back to its substantially sealed surface engaging position.

[00040] As can be understood from the above description and from the accompanying drawings, the present invention provides a dustless pick-up head system with a generally, centrally disposed sealed door assembly and debris inlet that allows the continuous entry of debris while precluding any loss of suction pressure within the entire width of the pick-up head and that precludes dust and other fine particulate matter from escaping the pick-up head housing all of which features are unknown in the prior art.

[00041] 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 pick-up head system for use with a surface cleaning vehicle having a fore-aft axis of travel, said dustless pick-up head system comprising:

a housing having a front wall, an interior and a suctioning bottom opening defined by a bottom peripheral edge and open in fluid communication and debris transfer relation to said interior, and defining a fore-aft axis;

a debris receiving main inlet in the front wall of said housing, in debris transfer relation to said interior of said housing for receiving debris to said housing;

a substantially sealed continuous-debris-passing door apparatus operatively mounted on said housing at said debris receiving main inlet in vertically movable relation for movement between a substantially sealed surface engaging position whereat said substantially sealed continuous-debris-passing door apparatus extends upwardly from the level of the bottom peripheral edge of said housing, and a raised position whereat said substantially sealed continuous-debris-passing door apparatus is raised above said substantially sealed surface engaging position;

a debris outlet in said housing open in fluid communication and debris transfer relation to said substantially hollow interior of said housing.

2. The pick-up head system of claim 1, wherein said substantially sealed continuous-debris-passing door apparatus comprises:

a door frame;

a rotatable door assembly having at least a first door portion and a second door portion joined together at a central pivot axis, and operatively mounted at said central pivot axis in rotatable relation on said door frame; and,

a seal operatively disposed between said rotatable door assembly and said door frame for sealing said rotatable door assembly with respect to said door frame, to thereby substantially preclude air from ingressing into said interior of said housing through said debris receiving main inlet and to thereby substantially preclude the

egress of debris from the interior of said housing, as said rotatable door assembly rotates to permit debris to enter the interior of said housing.

3. The pick-up head system of claim 1, wherein said substantially sealed continuous-debris-passing door apparatus is mounted on said housing in vertically movable relation by a pivotable mount, for pivotable movement about a sealed door axis.

4. The pick-up head system of claim 3, wherein said substantially sealed continuous-debris-passing door apparatus defines a front end and a back end and said pivotable mount is disposed adjacent the back end of said substantially sealed door apparatus.

5. The pick-up head system of claim 1, further comprising a drive mechanism for moving said substantially sealed continuous-debris-passing door apparatus between said substantially sealed surface engaging position and said raised position.

6. The pick-up head system of claim 1, wherein said drive mechanism comprises a hydraulic motor.

7. The pick-up head system of claim 1, wherein said housing further comprises a first side wall and a second side wall disposed on opposite sides of said debris receiving main inlet.

8. The pick-up head system of claim 7, wherein said first side wall and a second side wall are each made from a low friction material.

9. The pick-up head system of claim 8, wherein said first side wall and a second side wall are each made from ultra-high molecular weight (UHMW) polyethylene.

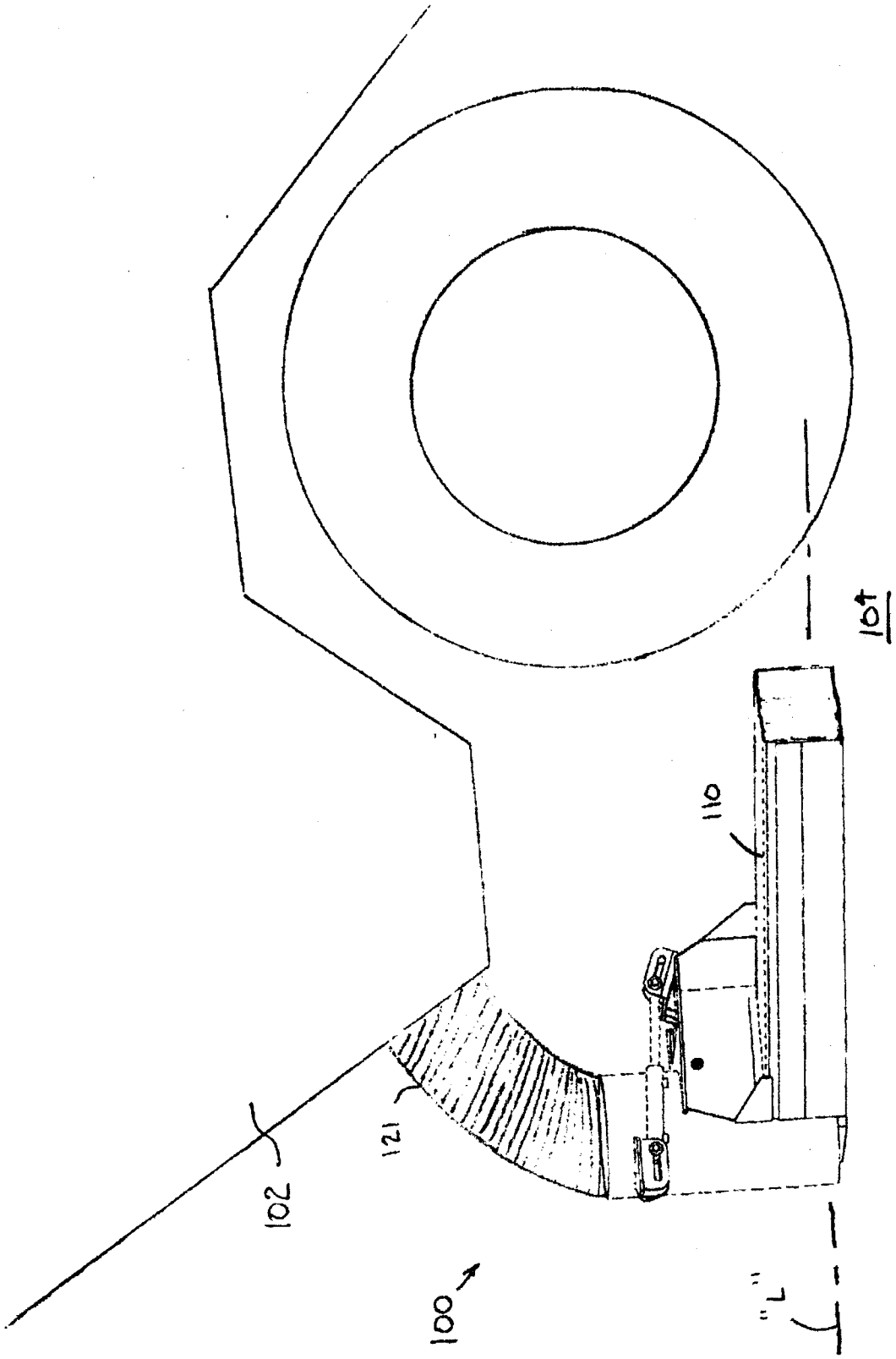


FIG. 1

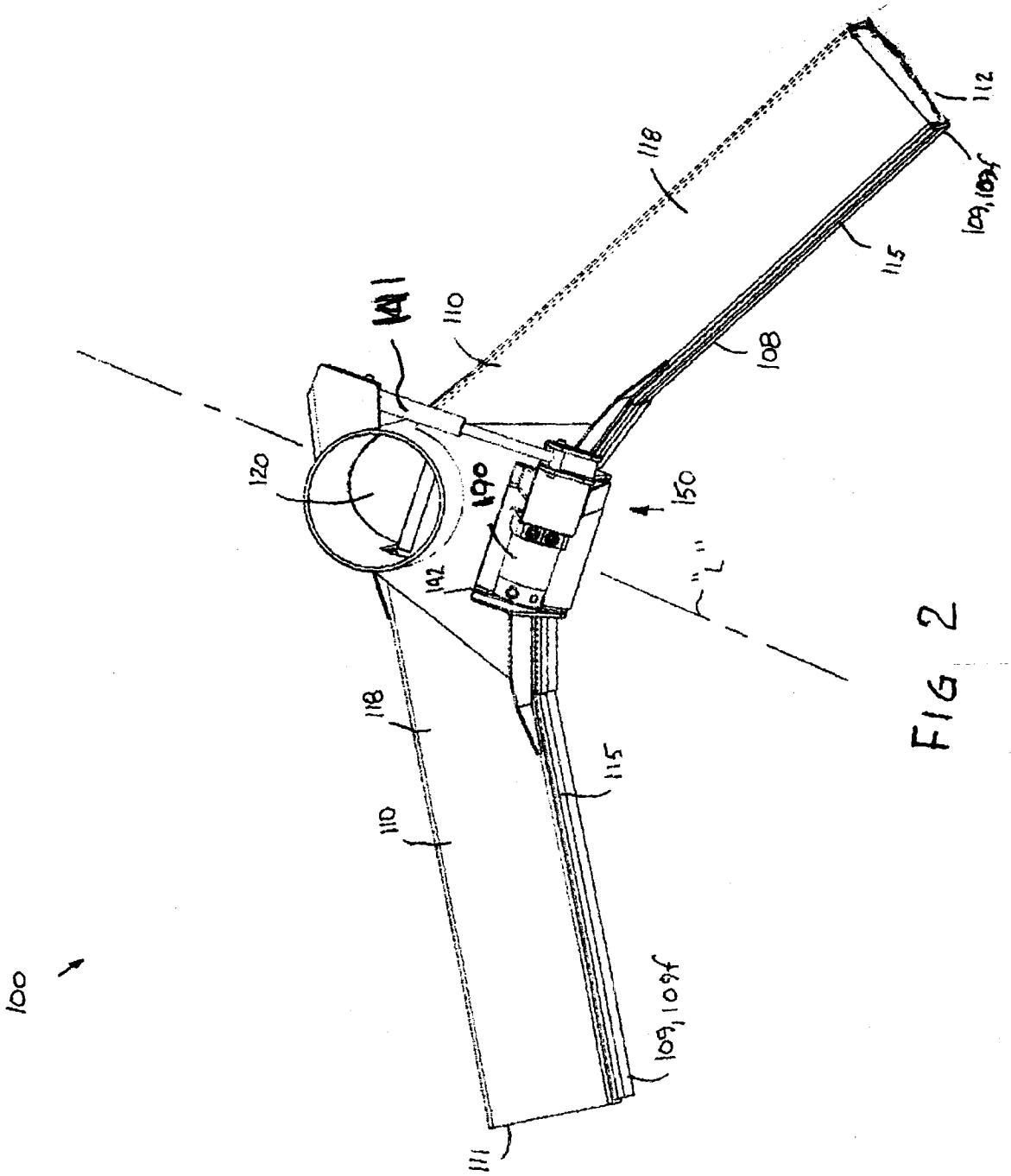


FIG 2

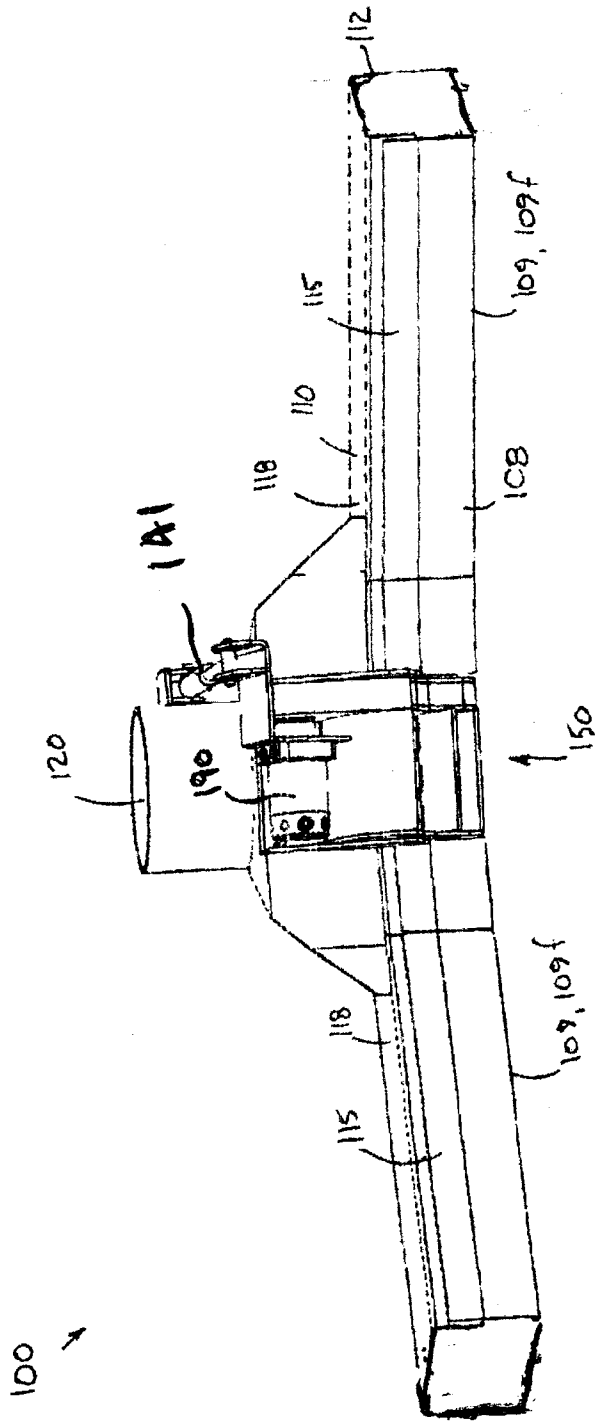

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115
100

FIG. 3

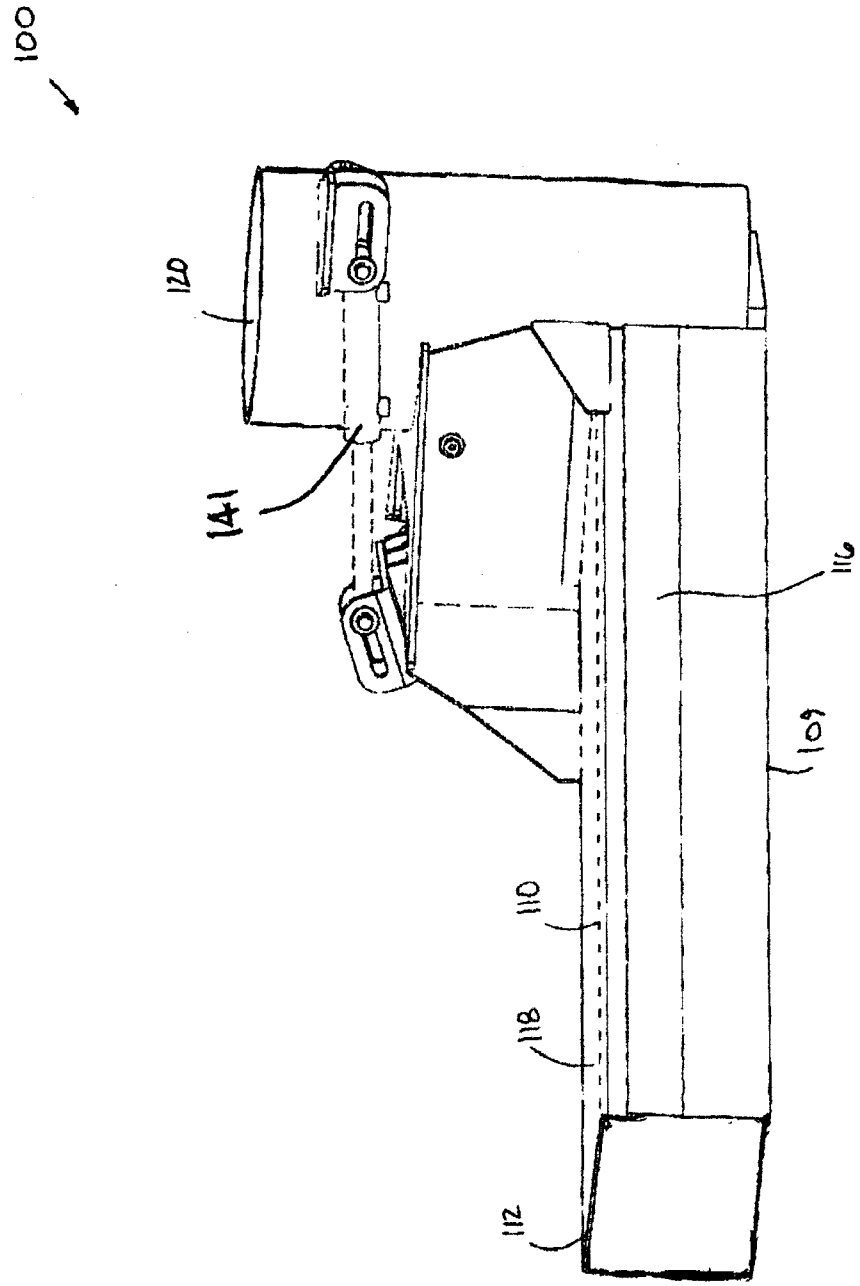


FIG 4

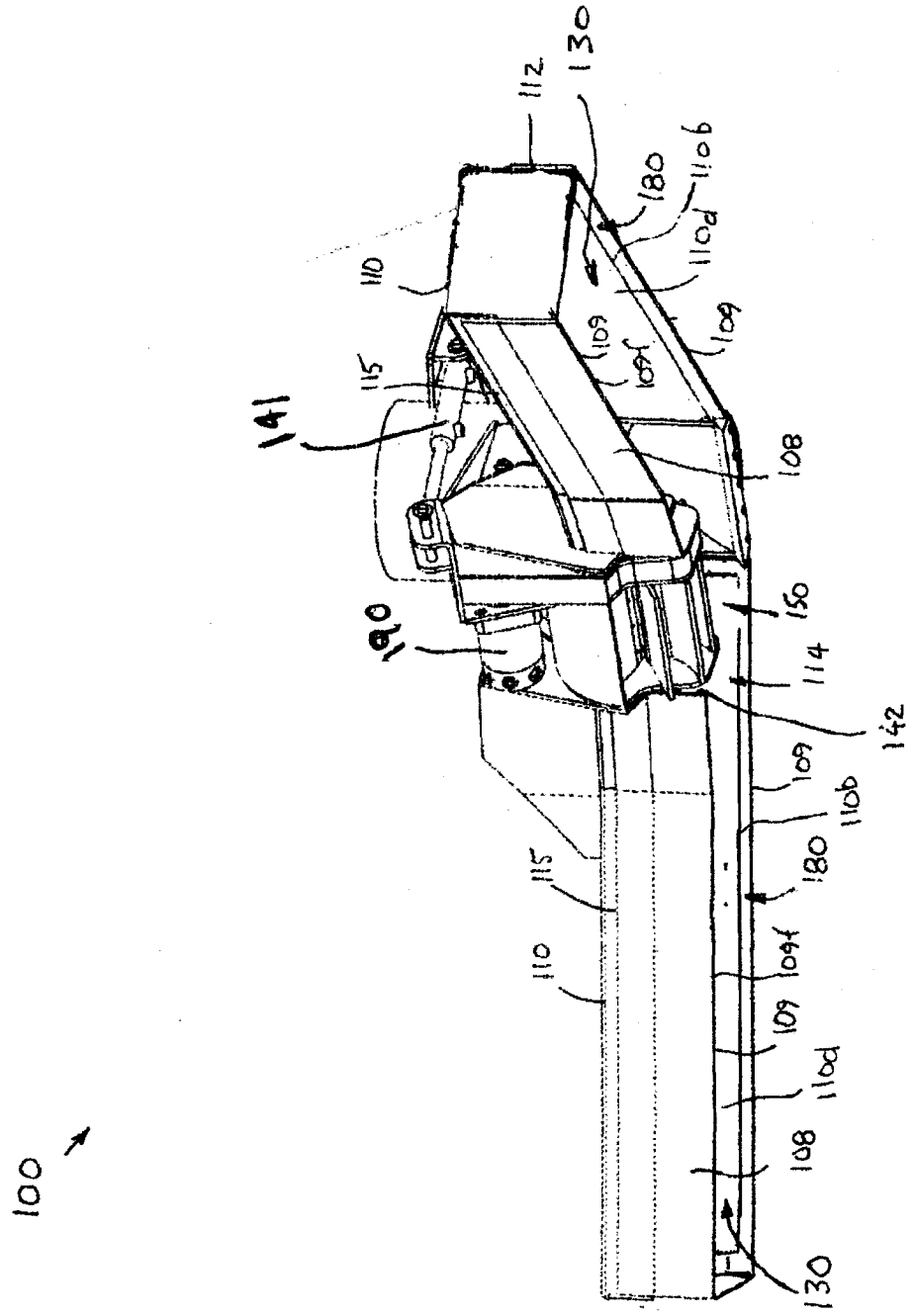

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110d
108
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FIG. 5

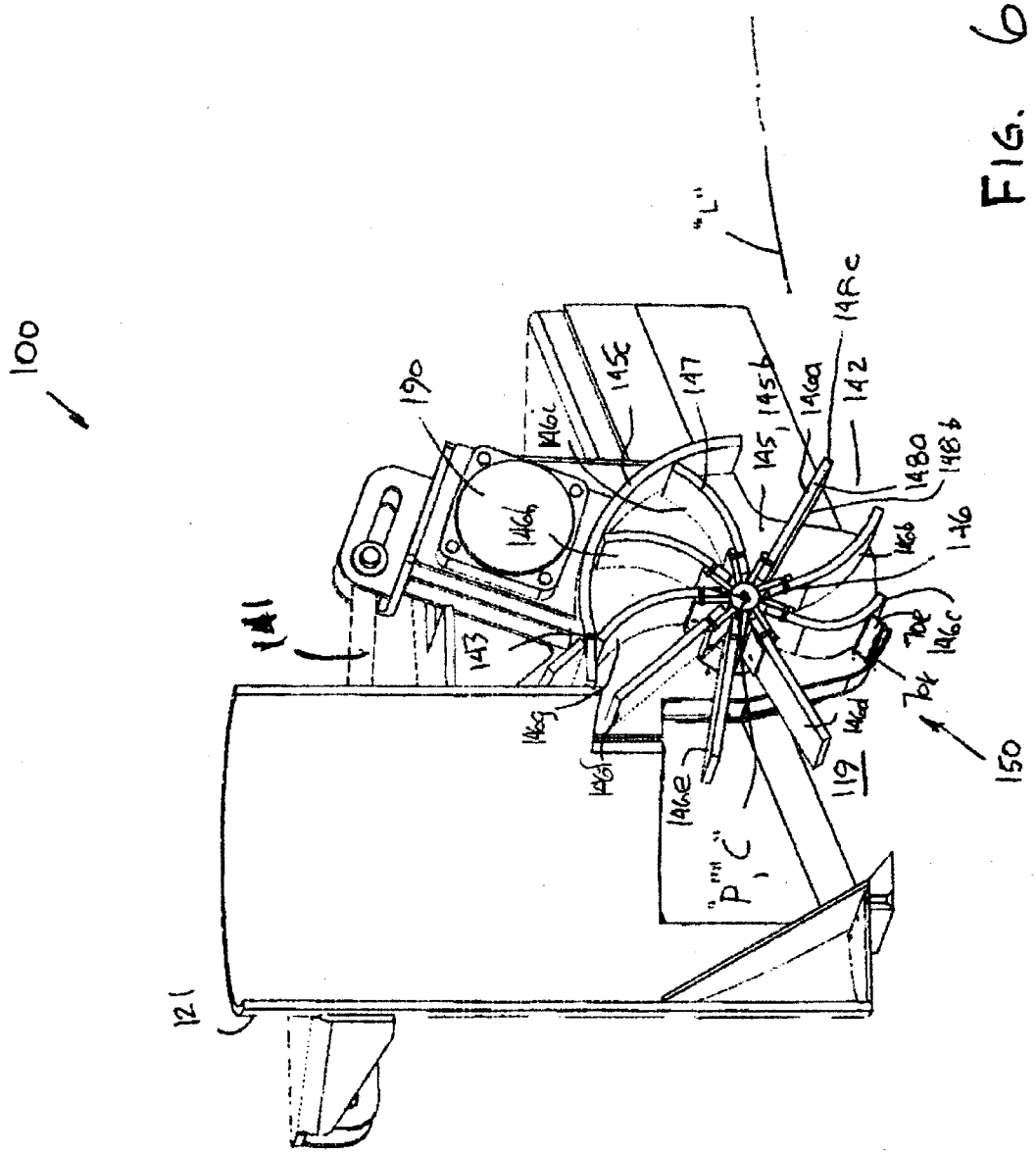

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145c
147
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146a
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146c
148a
148b
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146f
146e
146d
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"L"
"P"
"C"

FIG. 6

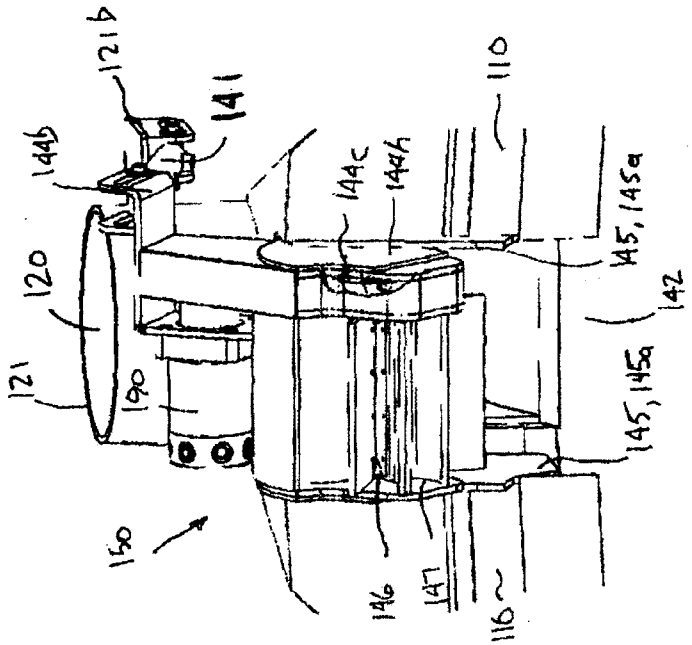

121b
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FIG 7

100

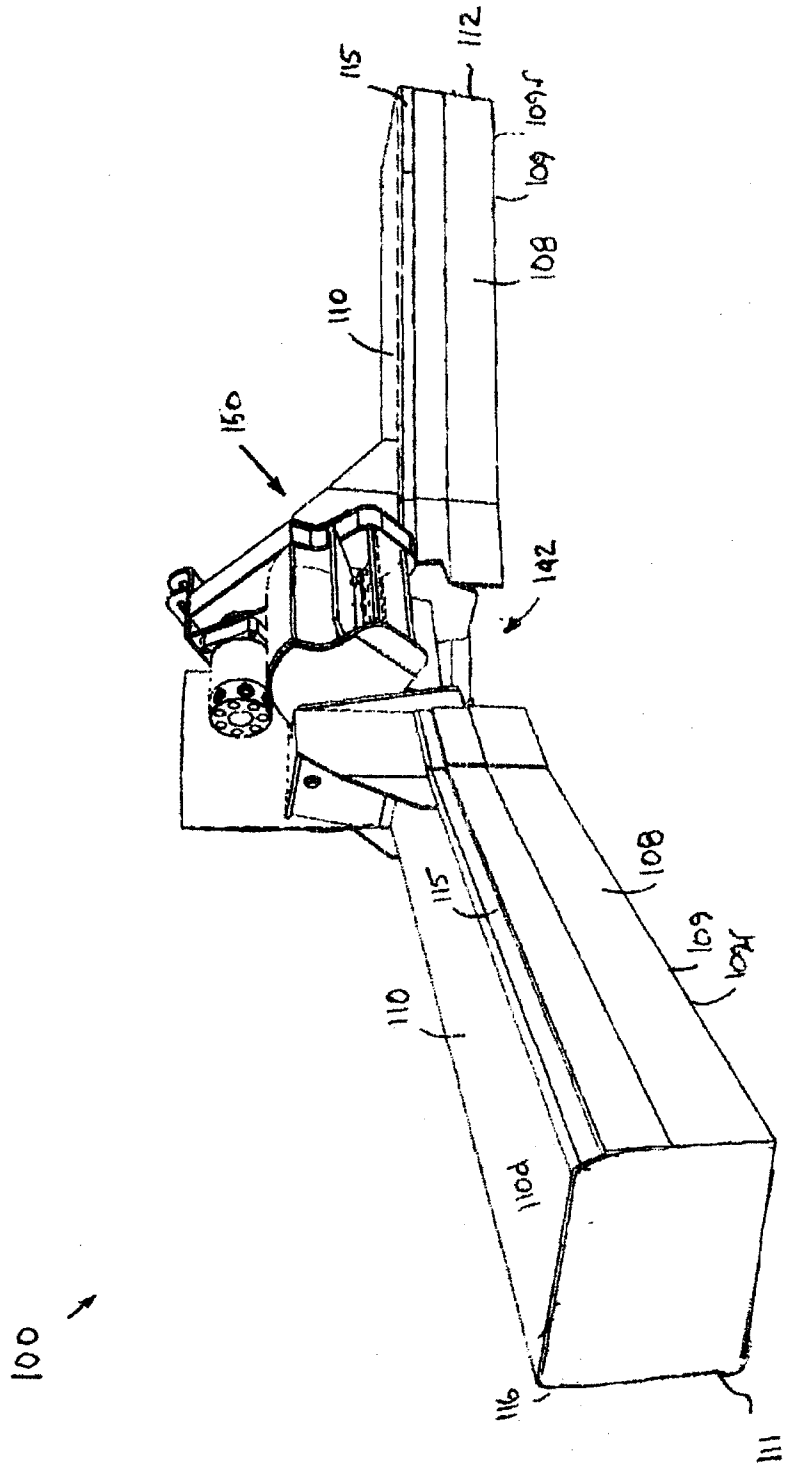


FIG 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2012/000580

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***E01H 1/08*** (2006.01) , ***A47L 9/08*** (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/LOW, A47L 9/08/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 : slid+ or mov+ or actuat+ or operativ+ or rais+ or lower+, door or opening, suc+ or vac+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 2009/0089963 A1 (VANDERLINDEN) 09 April 2009 (09-04-2009) * see Figures 1, 4	1, 3, 6 4, 5, 7-9
Y	US 3,862,469 (BURGOON) 28 January 1975 (28-01-1975) * see Figures 1, 5	4, 5, 7-9
Y	US 3,491,399 (DOLAN et al.) 27 January 1970 (27-01-1970) * see Figure 1, 3	4, 5, 7-9
A	AU 26791/84 A (QUINTEL) 18 October 1984 (18-10-1984) * see whole document	1-9

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

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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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
19 September 2012 (19-09-2012)	01 October 2012 (01-10-2012)

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2012/000580

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
US2009089963A1	09 April 2009 (09-04-2009)	CA2738702A1	02 April 2009 (02-04-2009)
		EP2203598A2	07 July 2010 (07-07-2010)
		US2009089971A1	09 April 2009 (09-04-2009)
		US8108964B2	07 February 2012 (07-02-2012)
		WO2009039623A2	02 April 2009 (02-04-2009)
		WO2009039623A3	22 May 2009 (22-05-2009)
US3862469A	28 January 1975 (28-01-1975)	None	
US3491399A	27 January 1970 (27-01-1970)	None	
AU2679184A	18 October 1984 (18-10-1984)	None	