



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.08.2013 Bulletin 2013/33

(51) Int Cl.:
A01B 59/06 (2006.01) E01H 5/06 (2006.01)

(21) Application number: **12155188.1**

(22) Date of filing: **13.02.2012**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(72) Inventor: **Engström, Stig**
833 31 Strömsund (SE)

(74) Representative: **Nilsson, Lars**
Awapatent AB
Studiegången 3
Box 665
831 40 Östersund (SE)

(71) Applicant: **AB Mähler & Söner**
881 50 Rossön (SE)

(54) **An implement**

(57) This invention relates to an implement arranged to be coupled to a vehicle, such as a snow plough or similar. The implement (100) comprises a tool (102) and a linkage (104), said linkage comprising a coupling frame (106) for attachment to said vehicle, a first supporting arm (112) having a first and a second end (112a, 112b) and a second supporting arm (114) having a first and a second end (114a, 114b). The first ends of said first and second supporting arms are pivotally connected to said coupling frame and the second ends of the first and second supporting arms are pivotally connected to the tool,

wherein the connecting points between the first ends of the supporting arms and the coupling frame are laterally spaced from each other and the connecting points between the second ends of the supporting arms and the tool are laterally spaced from each other. The linkage further comprises first actuating members (120, 122) arranged at each of the first and second supporting arms for exercising an adjustable downward or upward force on the tool through said first and second supporting arms. This construction provides for a stable construction that minimizes vibrations and a broad range of adjustability.

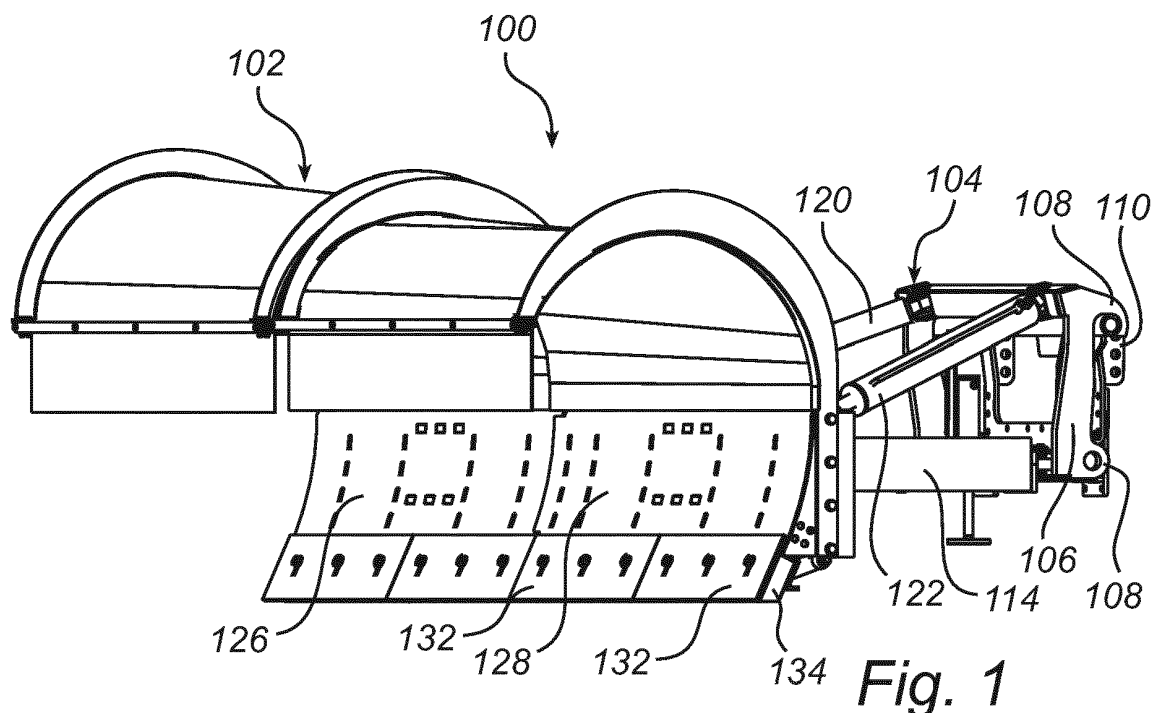


Fig. 1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to an implement arranged to be coupled to a vehicle. The implement comprises a tool and a linkage, wherein the linkage comprises a coupling frame for attachment to the vehicle, and two supporting arms pivotally connected to the coupling frame and to the tool.

BACKGROUND OF THE INVENTION

[0002] Common implements have a centre connection between the blade and the main parts of the linkage carrying the blade. The blade may be pivotable about a vertical shaft of the centre connection. Further the linkage comprises a reciprocating cylinder, which is pivotally connected with the blade beside the centre connection. The reciprocating cylinder is operated for adjusting the angle of the blade around a vertical axis at the centre connection. Such a centre mounting of the blade is disadvantageous in several respects, such as subject to large torque when the blade runs over a bump close to a side edge thereof, and vibrations occurring in the blade due to reciprocating movements when the working surface is uneven and the vehicle is driven at a substantial speed.

[0003] EP 587 175 discloses an alternative implement having a blade and a linkage where the linkage comprises two separate pivot cylinders, which are reciprocating for adjusting the angle of the blade. The pivot cylinders are positioned at a distance from each other. The linkage comprises several further pivot rods mounted above and below the pivot cylinders at the blade, in order to support the blade as regards pivoting about a horizontal/longitudinal axis of the blade. This construction is more robust to vibrations and different kind of torque forces than the centre connection. However, it is a complex construction with a large number of linkage parts and a large number of pivoting connections.

SUMMARY OF THE INVENTION

[0004] It is an object of the present invention to provide an implement that alleviates the above-mentioned problems of the prior art.

[0005] The object is achieved by an implement according to the present invention as defined in claim 1.

[0006] Thus, in accordance with an aspect of the present invention, there is provided an implement which is arranged to be coupled to a vehicle, such as a truck or a front loader. The implement comprises a tool and a linkage wherein the linkage, in turn, comprises a coupling frame for attachment to the vehicle. The linkage also comprises a first supporting arm having a first and a second end and a second supporting arm having a first and a second end. The first ends of said first and second supporting arms are pivotally connected to said coupling

frame and the second ends of said first and second supporting arms are pivotally connected to said tool, wherein the connecting points between the first ends of the supporting arms and the coupling frame are laterally spaced from each other and the connecting points between the second ends of the supporting arms and the tool are laterally spaced from each other. The linkage further comprises first actuating members arranged at each of the first and second supporting arms for exercising an adjustable downward or upward force on the tool through said first and second supporting arms. This construction, and in particular the lateral separation of the connecting points, provides for a solid construction which eliminates, or at least greatly reduces, problems with vibrations in the tool which are common in prior art solutions with a single, centre mounting of the tool. While providing this important structural stability, the construction of the implement of the present invention is still very straightforward without complicated link systems. Such link systems are generally rather maintenance-requiring and prone to become large amounts of play over time. Thanks to the first actuating members, the downward force of the implement of the present invention can be independently adjusted at different parts of the tool.

[0007] In accordance with an embodiment of the implement of the invention, the linkage further comprises a second actuating member, which is provided at the first supporting arm for effecting a lateral movement of the tool. This provides for the possibility of adjusting the position of the implement in a horizontal plane, for example adjusting the position of a snow plough over a road surface.

[0008] In accordance with an embodiment of the implement of the invention, the second actuating member comprises a hydraulic cylinder pivotally coupled to the first supporting arm and to the coupling frame. This is a reliable solution for obtaining a possibility of adjusting the horizontal position of the tool.

[0009] In accordance with an embodiment of the implement of the invention, at least one of the first and second supporting arms is telescopic. The provision of telescopic supporting arms provides a very flexible system. Telescopic arms allow a user to finely adjust the angle of the tool with respect to the direction of movement.

[0010] In accordance with an embodiment of the implement of the invention, each of the first actuating members comprises a hydraulic cylinder pivotally coupled to a respective supporting arm and the coupling frame, and wherein the first actuating members are arranged above and in a same vertical plane as the corresponding first and second supporting arm. By using hydraulic cylinders, the applied force can be finely adjusted and, since such hydraulic cylinders are capable of exerting very high forces, varied over a large range. The positioning of the hydraulic cylinders above and in line with the supporting arms provides for easy mounting thereof and at the same time the cylinders are protected to a certain extent from stones or other debris flying up from the road by the sup-

porting arms.

[0011] In accordance with an embodiment of the implement of the invention, the tool comprises a first and a second segment, and wherein the second end of said first supporting arm is pivotally connected to said first segment of the tool and the second end of said second supporting arm is pivotally connected to the second segment of said tool.

[0012] In accordance with an embodiment of the implement of the invention, the first and second segments of the tool are pivotally adjoined allowing for the first and second segments to pivot around a horizontal axis relative to each other. By providing a pivotal connection between the two segments, the tool can adapt itself to varying working conditions.

[0013] In accordance with an embodiment of the implement of the invention, the pivotal connection between the first and second supporting arms and the tool comprises a hinge having a vertical axis of rotation. A hinge with a horizontal axis of rotation ensures structural stability while still providing a freedom of movement between the segments of the tool so that the tool can adapt to varying working conditions.

[0014] In accordance with an embodiment of the implement of the invention, the tool is a snow plough. The construction of the invention is particularly suitable for use with snow ploughs where high operational speeds are desirable and where the conditions may be extremely adverse with rough road surfaces. This combination, high speed and rough road surfaces, is extremely prone to cause undesirable vibrations in the snow plough, which, in turn, causes the road surface to become even more uneven. Therefore, the construction of the invention is very suitable for snow ploughs.

[0015] In accordance with an embodiment of the implement of the invention, the snow plough comprises a cutting element provided at a lower edge thereof, and wherein said cutting element is inclined such that a lowermost edge thereof constitutes a leading edge during normal use of the snow plough. Such positive angle of approach ensures a thorough clearing of the road surface.

[0016] These and other aspects, and advantages of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The invention will now be described in more detail and with reference to the appended drawings in which:

Figs. 1 to 4 schematically show an embodiment of the implement according to the present invention in different views; and

Figs. 5 and 6 schematically illustrates different operational states of the implement.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0018] An embodiment of the implement 100 according to the present invention comprises a tool 102 and a linkage 104. In this embodiment the tool is a snow plough, but other kinds of tools are applicable as well, such as a road grader blade or a bulldozer blade. The implement is attachable to a vehicle, typically a road vehicle such as a truck. However, depending on the kind of tool of course other kinds of vehicles can be used, such as wheel loader or a tractor. However, as is evident from this application the implement is particularly advantageous when the vehicle is driving at a substantial speed, which is the typical situation for snow ploughing a road with a truck.

[0019] The linkage 104 comprises a coupling frame 106, which is provided with common engagement portions 108 such as hooks, shaft seats etc., for the very attachment to a complementary coupling frame 110 of the vehicle. Furthermore, the linkage 104 comprises a first supporting arm 112, having a first end 112a, and a second end 112b; and a second supporting arm 114, having a first end 114a, and a second end 114b. The first ends 112a, 114a of the supporting arms 112, 114 are pivotally connected with the coupling frame 106 at a distance from each other. In other words, the first ends are laterally distanced from each other such that the first end 112a of the first supporting arm 112 is connected with the coupling frame on one side of a centre of the coupling frame 106, and the first end 114a of the second supporting arm 114 is connected with the coupling frame 106 on the other side of the centre of the coupling frame 106. Similarly, the second ends 112b, 114b of the supporting arms 112, 114 are connected with the tool 102 at a distance from each other. The width of the tool 102 is considerably wider than the width of the coupling frame 106, and the lateral distance between the second ends 112b, 114b is considerably greater than between the first ends 112a, 114a. However, this relation is not essential and may differ depending on the type of tool.

[0020] The pivotal connections between the first and second supporting arms 112, 114 and the tool 102, i.e. each of the connections at the second ends 112b, 114b, comprises a hinge 116, 118 having a vertical axis of rotation. In other words, the second ends 112b, 114b are hingedly connected with the tool 102. Thereby the connections between the first and second supporting arms 112, 114 and the tool 102 are rigid to tool movements about a horizontal, or longitudinal, axis, which provides a stable structure without several extra rods as in the prior art mentioned above.

[0021] The linkage 104 further comprises first actuating members 120, 122, arranged at each of the first and second supporting arms 112, 114 for exercising an adjustable downward or upward force on the tool 102, through the first and second supporting arms 112, 114. Each of the first actuating members comprises a hydraulic cylinder 120, 122 pivotally coupled to a respective supporting arm 112, 114 and the coupling frame 106. The

first actuating members 120, 122 are arranged above and in a same vertical plane as the corresponding first and second supporting arm 112, 114. More particularly, each first actuating member 120, 122 has a first end 120a, 122a, which is pivotally connected with the coupling frame 106; and a second end 120b, 122b, which is pivotally connected with the first supporting arm 112, and the second supporting arm 114, respectively, at a top surface thereof. Thus, the first actuating members 120, 122 are placed on top of the supporting arms 112, 114 at an angle to the arms.

[0022] At least one of the first and second supporting arms 112, 114 is telescopic, and in this embodiment both arms 112, 114 are telescopic. Thereby, it is simple to adjust the angle of the tool 102 relative to the direction of movement of the vehicle, and thus of the tool 102.

[0023] The linkage 104 further comprises a second actuating member 124, which is provided at the first supporting arm 112 for effecting a lateral movement of the tool 102. The second actuating member 124 comprises a hydraulic cylinder 124 pivotally coupled to the first supporting arm 112 and to the coupling frame 106. More particularly, a first end 124a of the second actuating member 124 is pivotally connected with the coupling frame 106 between the first ends 112a, 114a of the first and second supporting arms 112, 114. A second end 124b of the second actuating member 124 is pivotally connected with the first supporting arm 112 at an inside thereof. The second actuating member 124 extends in the same lateral plane as the first and second supporting arms 112, 114. Of course, it is possible to couple the second actuating member 124 to the second supporting arm 114 instead or even using a second actuating members 124 for each first and second supporting arm 112, 114.

[0024] The linkage 104 is operated as follows. The driver of the vehicle is able to control the angle of the tool 102 by adjusting the length of the supporting arms 112, 114. Furthermore, the driver is able to control the lateral position of the tool 102 by adjusting the length of the second actuating member 124. At the same time the angle is slightly changed which may necessitate a correction by operating one of the arms 112, 114. Comparing Fig.3 with Fig. 2 the tool 102 has been moved to the right seen from a direction of vehicle movement, by extending the second actuating member 124, and the angle of the tool 102 has been adjusted by both retracting the first, or right, supporting arm 112 and extending the second, or left, supporting arm 114.

[0025] By operating the first actuating members 120, 122, i.e. extending or retracting them, the driver is able to adapt the force exerted by the tool on the ground to different ground conditions. This has a further advantage. Traditionally the tools rest on the ground with their own weight. In order to decrease the risk of vibrating, or even jumping tools, they have been made heavier than would be necessary from a perspective of strength. A heavy tool 102 is disadvantageous due to a higher cost and due

to loading the vehicle with an unnecessary weight. With the present construction the weight of the tool can be optimised/minimized since the first actuating members 120, 122 can be operated to increase the ground pressure to stabilise the tool 102. Since there are two first actuating members 120, 122 which act upon the tool 102 at laterally spaced positions the stabilizing effect is substantial.

[0026] The tool 102 comprises a first segment 126, and a second segment 128, which are interconnected by means of a pivot connection 130 allowing the first and second segments 126, 128 to pivot around a horizontal axis of the pivot connection 130 relative to each other. The first and second supporting arms 112, 114 are connected with a respective one of the first and second segments 126, 128. Thereby, as most schematically illustrated in Figs. 5 and 6, the tool 102 is able to adapt to different ground profiles by one or both segments 126, 128 sloping in either direction.

[0027] In the present embodiment the tool 102 is a snow plough. The snow plough 102 comprises exchangeable cutting elements 132 provided at a lower edge thereof, wherein the cutting elements 132 are inclined such that a lowermost edge thereof constitutes a leading edge during normal use of the snow plough 102. Furthermore, the cutting elements are mounted at security holders 134 preventing damages on the tool as a whole if the cutting elements are stuck in the ground or the like.

[0028] Above an embodiment of the implement according to the present invention as defined in the appended claims has been described. This should only be seen as a merely non-limiting example. As understood by the person skilled in the art, many modifications and alternative embodiments are possible within the scope of the invention as defined by the appended claims.

[0029] For example, the tool can be made as a solid unit instead of as two pivotally adjoined segments, or it can be made as more than two segments.

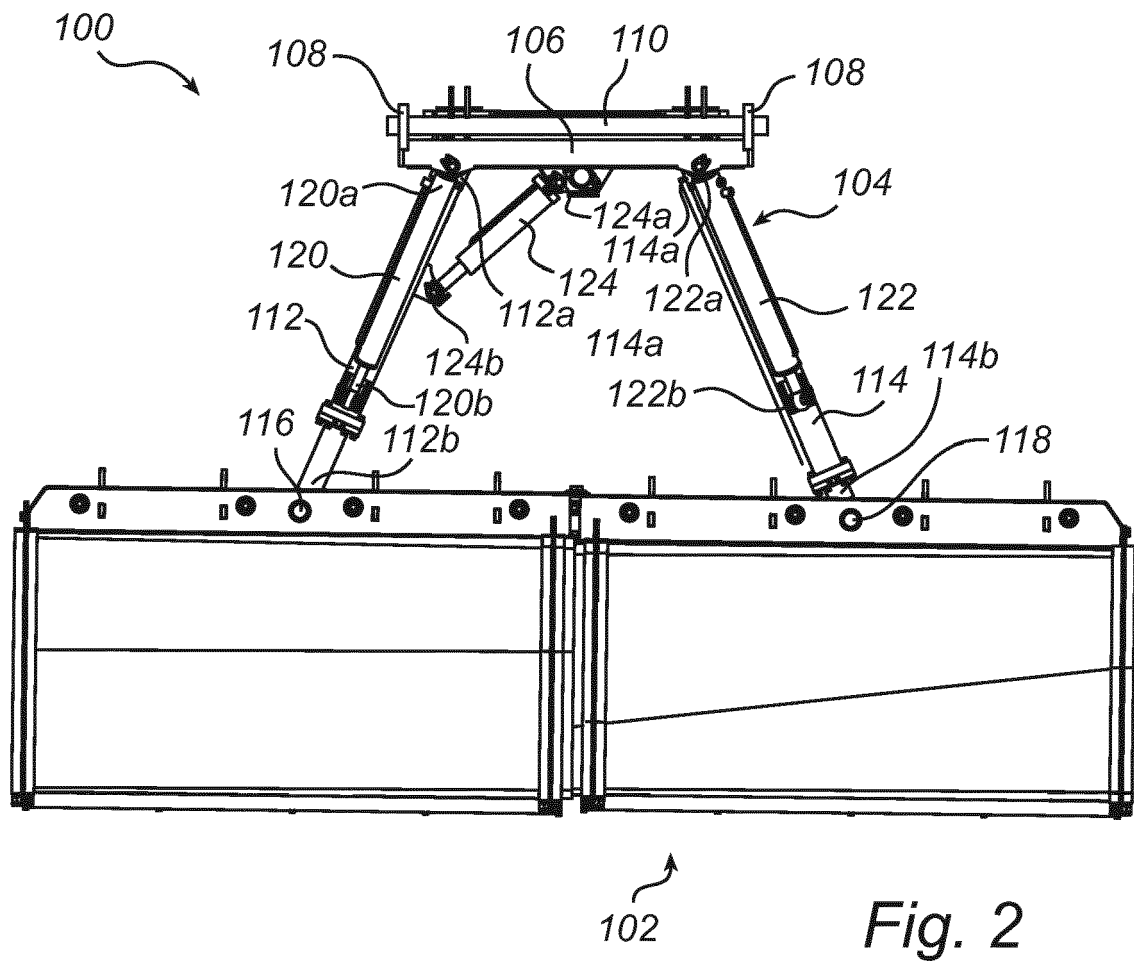
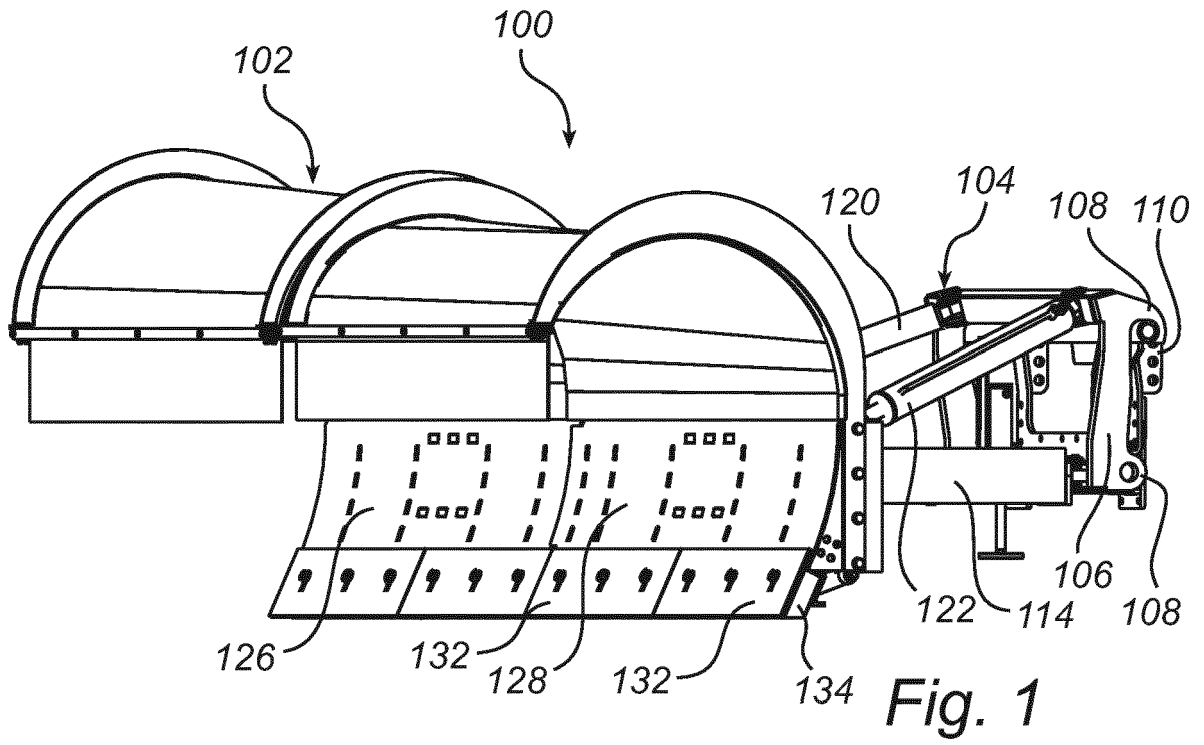
[0030] The number of supporting arms is optional as well, although at least two arms is preferred, and at least one arm per segment, when the tool is segmented.

[0031] It is to be noted that for the purposes of his application, and in particular with regard to the appended claims, the word "comprising" does not exclude other elements or steps, and the word "a" or "an" does not exclude a plurality, which per se will be evident to a person skilled in the art.

Claims

1. Implement arranged to be coupled to a vehicle, said implement (100) comprising a tool (102) and a linkage (104), said linkage (104) comprising a coupling frame (106) for attachment to said vehicle, a first supporting arm (112) having a first and a second end (112a, 112b), a second supporting arm (114) having

- a first and a second end (114a, 114b), said first ends (112a, 114a) of said first and second supporting arms (112, 114) being pivotally connected to said coupling frame (106) and said second ends (112b, 114b) of said first and second supporting arms (112, 114) being pivotally connected to said tool (102), wherein the connecting points between the first ends (112a, 114a) of the supporting arms (112, 114) and the coupling frame (106) are laterally spaced from each other and the connecting points between the second ends (112b, 114b) of the supporting arms (112, 114) and the tool (102) are laterally spaced from each other, the linkage (104) further comprising first actuating members (120, 122) arranged at each of the first and second supporting arms (112, 114) for exercising an adjustable downward or upward force on the tool (102) through said first and second supporting arms (112, 114).
2. Implement according to claim 1, wherein the linkage (104) further comprises a second actuating member (124), which is provided at the first supporting arm (112) for effecting a lateral movement of the tool (102).
 3. Implement according to claim 2, wherein the second actuating member (124) comprises a hydraulic cylinder (124) pivotally coupled to the first supporting arm (112) and to the coupling frame (106).
 4. Implement according to any of claims 1-3, wherein at least one of the first and second supporting arms (112, 114) is telescopic.
 5. Implement according to any of claims 1-4, wherein each of the first actuating members (120, 122) comprises a hydraulic cylinder (120, 122) pivotally coupled to a respective supporting arm (112, 114) and the coupling frame (106), and wherein the first actuating members (120, 122) are arranged above and in a same vertical plane as the corresponding first and second supporting arm (112, 114).
 6. Implement according to any of claims 1-5, wherein the tool (102) comprises a first and a second segment (126, 128), and wherein the second end (112b) of said first supporting arm (112) is pivotally connected to said first segment (126) of the tool (102) and the second end (114b) of said second supporting arm (114) is pivotally connected to the second segment (128) of said tool (102).
 7. Implement according to claim 6, wherein the first and second segments (126, 128) of the tool (102) are pivotally adjoined allowing for the first and second segments (126, 128) to pivot around a horizontal axis relative to each other.
 8. Implement according to any of claims 1-7 wherein the pivotal connection between the first and second supporting arms (112, 114) and the tool (102) comprises a hinge (116, 118) having a vertical axis of rotation.
 9. Implement according to any of claims 1-8, wherein the tool (102) is a snow plough.
 10. Implement according to claim 9, wherein the snow plough (102) comprises a cutting element (132) provided at a lower edge thereof, and wherein said cutting element (132) is inclined such that a lowermost edge thereof constitutes a leading edge during normal use of the snow plough.



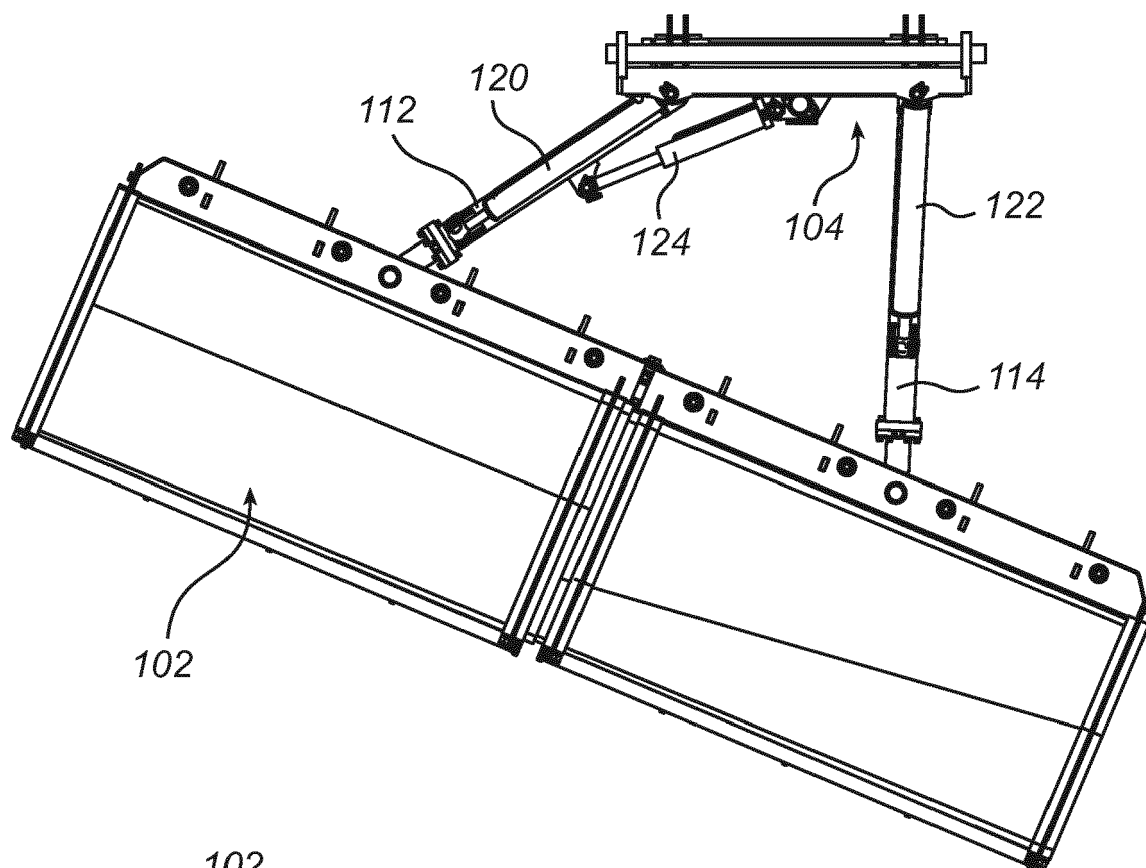


Fig. 3

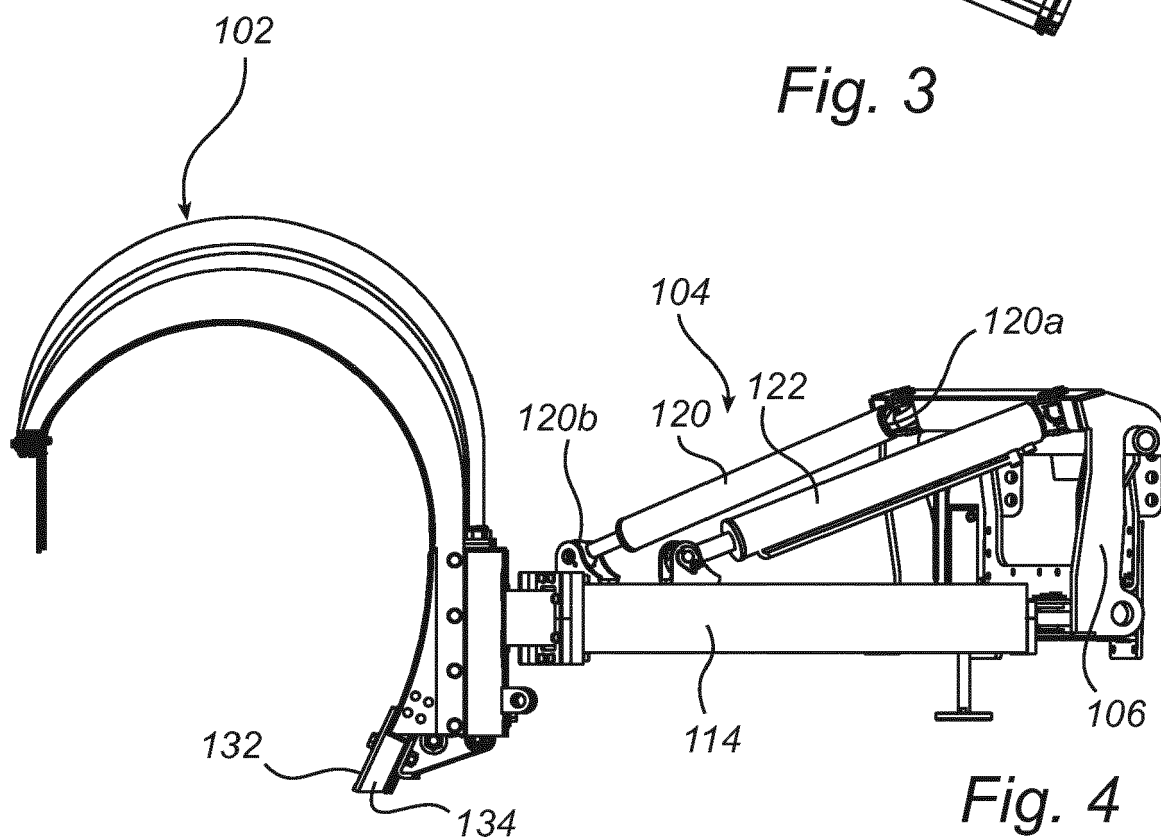


Fig. 4

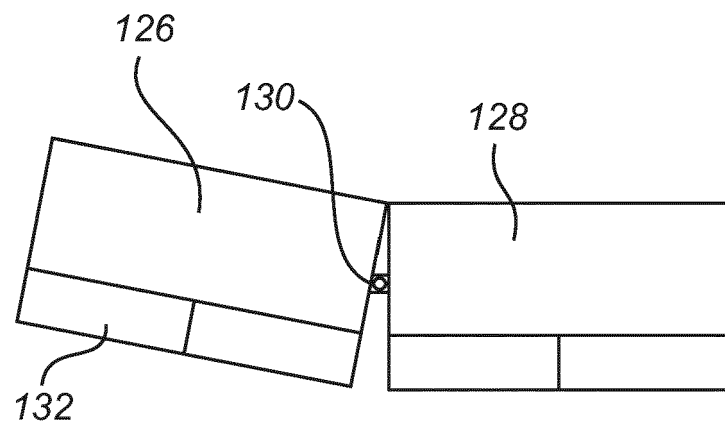


Fig. 5

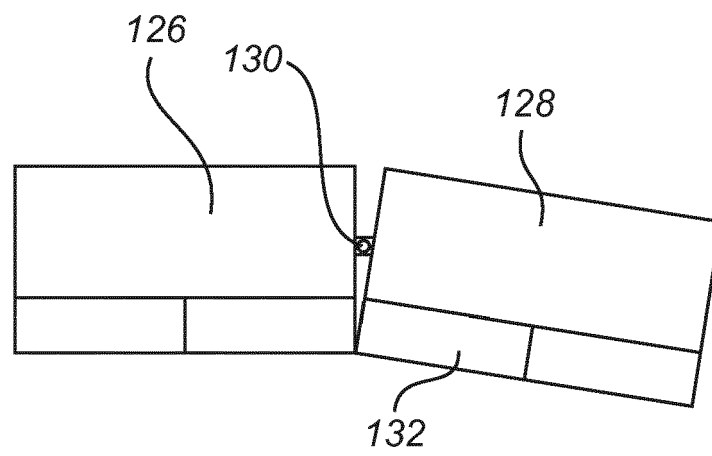


Fig. 6



EUROPEAN SEARCH REPORT

Application Number
EP 12 15 5188

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2011/050460 A1 (MACHINERIES PRONOVOST INC [CA]; DALOIS JEROME [CA]; CHAMPAGNE CHRISTIA) 5 May 2011 (2011-05-05) * claim 1; figures * -----	1,5	INV. A01B59/06 E01H5/06
X	WO 2010/049896 A2 (DEFrancq HUBERT [FR]) 6 May 2010 (2010-05-06) * abstract; figures * -----	1,5	
X	DE 32 18 385 A1 (RABEWERK CLAUSING HEINRICH [DE]) 17 November 1983 (1983-11-17) * figures 2,3 * -----	1,5	
X	DE 103 46 413 A1 (DEERE & CO [US]) 4 May 2005 (2005-05-04) * the whole document * -----	1,4,8	
Y	US 4 125 271 A (WIBOLTT ALFRED E J J ET AL) 14 November 1978 (1978-11-14) * the whole document * -----	1,4,5,9,10	
Y	US 7 028 423 B1 (CURRY FLOYD E [US]) 18 April 2006 (2006-04-18) * the whole document * -----	1,4,5,9,10	A01B E01H E02F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 5 July 2012	Examiner Alff, Robert
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

 1
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 12 15 5188

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

05-07-2012

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
WO 2011050460	A1	05-05-2011	CA	2683575 A1	27-04-2011
			CA	2777641 A1	05-05-2011
			WO	2011050460 A1	05-05-2011

WO 2010049896	A2	06-05-2010	CA	2740435 A1	06-05-2010
			EP	2364077 A2	14-09-2011
			FR	2937827 A1	07-05-2010
			US	2011262255 A1	27-10-2011
			WO	2010049896 A2	06-05-2010

DE 3218385	A1	17-11-1983	NONE		

DE 10346413	A1	04-05-2005	NONE		

US 4125271	A	14-11-1978	BE	843240 A1	22-12-1976
			BR	7604626 A	31-01-1978
			CA	1080538 A1	01-07-1980
			CH	603916 A5	31-08-1978
			DE	2628108 A1	22-12-1977
			DK	262176 A	12-12-1977
			FR	2354038 A1	06-01-1978
			IT	1062000 B	30-04-1983
			JP	52152632 A	19-12-1977
			NL	7607082 A	13-12-1977
			SE	430369 B	14-11-1983
			SE	7607187 A	12-12-1977
			US	4125271 A	14-11-1978

US 7028423	B1	18-04-2006	NONE		

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 587175 A [0003]