



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
22.11.2023 Bulletin 2023/47

(51) International Patent Classification (IPC):
E01C 19/48^(2006.01)

(21) Application number: **22173776.0**

(52) Cooperative Patent Classification (CPC):
E01C 19/48; E01C 2301/14

(22) Date of filing: **17.05.2022**

(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
Designated Validation States:
KH MA MD TN

(71) Applicant: **Volvo Construction Equipment AB**
631 85 Eskilstuna (SE)

(72) Inventor: **Mahler, Anton**
30974 Wennigsen (DE)

(74) Representative: **Eisenführ Speiser**
Patentanwälte Rechtsanwälte PartGmbB
Stralauer Platz 34
10243 Berlin (DE)

(54) **A PAVING SCREED, A PAVING SCREED EXTENSION, A PAVING SCREED BROADENING PART AND A PAVER**

(57) Paving screed (2) having at least one screed body partition (100), the at least one screed body partition (100) having at least one cross strut (200) extending at a front side (101) or at a back side (102) of the screed body partition (100) from a centered part (110) to an outer part (120) of the screed body partition, wherein an outer end (220) of the at least one cross strut (200) arranged at the outer part (120) of the screed body partition is po-

sitioned closer to a bottom side (105) of the paving screed (2) facing a pavement than an inner end (210) of the at least one cross strut (200) arranged at the centered part (110) of the screed body partition (100), the cross strut (200) transforming a bending of the screed body partition in horizontal direction into a twisting. A paving screed extension and a paving screed broadening part are also disclosed.

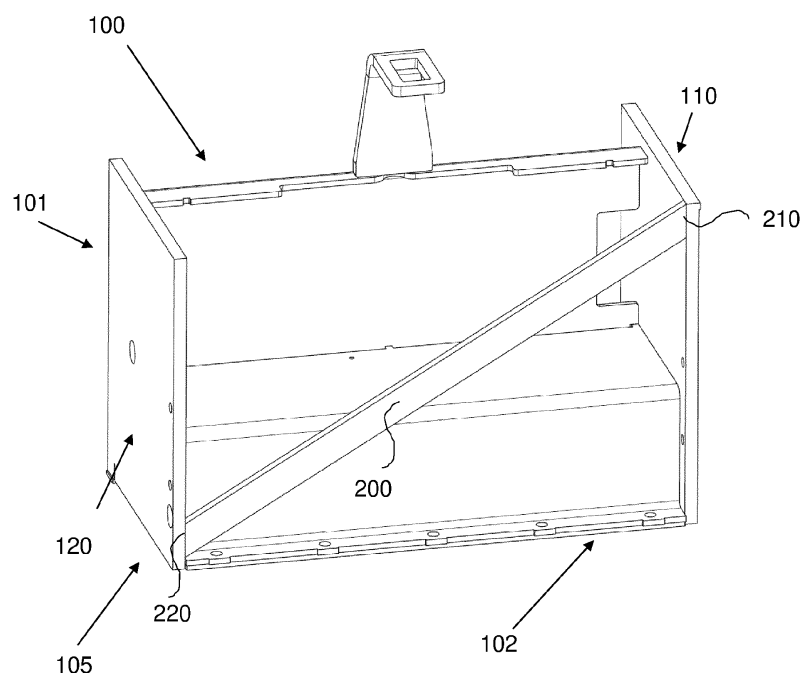


Fig. 2

Description

TECHNICAL FIELD

[0001] The invention relates to a paving screed, a paving screed extension, a paving screed broadening part and a paver.

[0002] The invention is applicable on construction vehicles having a paving screed. In particular, the invention is applicable on pavers.

BACKGROUND

[0003] During paving, the material (commonly asphalt) lies in front of the screed. The paver pulls the screed and the material is distributed, compacted and smoothed by the screed while the screed moves. The force of the material then causes the screed to deform. This is especially the case when bigger screed lengths are used. The force of the material onto the screed leads to an elastic deformation and the screed twists over the length because the material is normally only in touch with the lower end of the screed front surface.

[0004] Such a deformation like twisting the screed changes the angle of attack and this leads to the effect that wide screeds tend to produce a lower thickness at the screed's ends.

[0005] Today a screed tensioning device, a hydraulic cylinder which delivers constant force, is used to suppress such effects. The constant force of the hydraulic cylinder is used to pull the lower end of the screed so the deformation -caused by the material- can be removed. Typically screed tensioning is needed for screed lengths above 7 m. The location where the screed tensioning device is connected to can be changed. With this, the effect of the tensioning device can be adjusted for the paving lengths the tensioning device is needed for. This solution requires active parts like the hydraulic cylinder, which have to be maintained and controlled to function properly. Such solutions using cylinders are for example described in CN102864726.

[0006] In CN203821207 a further possibility to improve bending and torsional strength in the paving screed is described using a reinforcing member between front and rear plate.

SUMMARY

[0007] An object of the invention is to provide a paving screed or paving screed extension with an improved resistance to deformation preferably resulting in an evenly distribution of the paving material over the whole length of the paving screed.

[0008] According to one aspect, the object is achieved by a paving screed according to claim 1.

[0009] In particular, the paving screed has at least one screed body partition. The at least one screed body partition has at least one cross strut extending at a front side

or at a back side of the screed body partition from a centered part to an outer part of the screed body partition. Thereby an outer end of the at least one cross strut arranged at the outer part of the screed body partition is positioned closer to a bottom side of the paving screed facing a pavement than an inner end of the at least one cross strut arranged at the centered part of the screed body partition. The cross strut transforms a bending of the screed body partition in horizontal direction into a twisting.

[0010] The invention is based on the recognition that with the aid of the cross strut in the screed body partition a bending in horizontal direction of the screed caused by the force of the paving material can be used to induce twisting in the screed body and this twisting serves as a compensatory movement resulting in an even pavement facing surface of the paving screed and thus in evenly distributed material. Thus deformation in horizontal direction is transformed into a useful compensatory twisting movement. The invention further includes the recognition that this effect is achieved only by the arrangement of the cross strut obliquely from above at a centered part to bottom at an outer part. Thus by inducing the twisting the cross strut lifts the outer end of the screed body partition to level the height of the pavement facing surface of the paving screed. No active components are needed for the compensatory movement. The construction produces the correction from the external load. Thus a further advantage of the invention is that more external load (by more material) will lead to more corrective twisting against the bad influence of more material. In other words the paving screed according to the invention will care for itself by design without further adjustments needed.

[0011] In the following further embodiments of the paving screed are described, which can be combined if not described as alternatives.

[0012] According to one embodiment of the paving screed the inner end of the at least one cross strut is arranged at a position higher than a torsional centre of the screed body partition and the outer end of the at least one cross strut is arranged at a position lower than the torsional centre of the screed body partition. This leads to a further improved compensatory movement.

[0013] In a further embodiment the at least cross strut further extends from a plane nearer to the front side to a plane nearer to a back side of the screed body partition. Such an arrangement may in particular be useful for application with restricted installation space. Alternatively the at least one cross strut extends in a plane parallel to a front side of the screed body partition. This arrangement results in higher twisting and is thus normally preferred.

[0014] In a further embodiment the screed body partition is a main single screed section or one section of a main multiple sections screed or a screed extension, which is arranged behind and adjacent to a main screed section or a screed broadening part, which is arranged flanking to a main screed section. The arrangement of at least one cross strut in all of this sections or part of a

paving screed may be useful. Furthermore also combinations of several cross struts in the different sections and or parts lead to a further improved complementary movement. Preferably in a paving screed having multiple sections, each of the multiple sections has at least one cross strut.

[0015] In a further embodiment in the screed body partition a first cross strut extends at a front side and a second cross strut extends at a back side of the screed body partition.

[0016] Preferably the at least one cross strut is arranged at an angle in the range of 10 to 85° with respect to the bottom side of the paving screed.

[0017] In an embodiment of the paving screed the at least one cross strut comprises several single struts. Alternatively the at least one cross strut is massive or has a hollow structure, having for example a round, oval or polygonal cross-section. For example a tube can be used. The cross-section of the cross strut has to be designed sufficiently large to ensure buckling safety and on the other hand sufficiently small to allow twisting.

[0018] In a further embodiment the cross strut is an integral part of a sheet element of the screed body partition, especially of a stabilizing angle sheet of the screed body partition. Thus the cross strut can be integrated in further components of the screed body.

[0019] According to a further embodiment in a paving screed having a stabilizing angle sheet extending from the centered part of the screed body partition to the outer part of the screed body partition, the cross sheet has at least one recess. This embodiment enables an improved twisting.

[0020] According to a further embodiment in a paving screed having two screed body partitions, each with at least one cross strut and being built up symmetrically, one of the two screed body partitions with at least one cross strut is arranged preferably in a left part of the paving screed while the other is arranged in a corresponding right part of the paving screed.

[0021] According to a second aspect of the invention, the object is achieved by a paving screed extension according to claim 12. The paving screed extension is able to be arranged behind and adjacent to a main screed section and has at least one screed body partition. The at least one screed body partition has at least one cross strut extending at a front side or at a back side of the screed body partition from a centered part to an outer part of the screed body partition, wherein an outer end of the at least one cross strut arranged at the outer part of the screed body partition is positioned closer to a bottom side of the screed facing the pavement than an inner end of the at least one cross strut arranged at the centered part of the screed body partition, the cross strut transforming a bending of the screed body partition in horizontal direction into a twisting.

[0022] Furthermore, according to a third aspect the object is achieved by a paving screed broadening part, which is able to be arranged flanking to a main screed

section and has at least one screed body partition. The at least one screed body partition has at least one cross strut extending at a front side or at a back side of the screed body partition from a centered part to an outer part of the screed body partition, wherein an outer end of the at least one cross strut arranged at the outer part of the screed body partition is positioned closer to a bottom side of the screed facing the pavement than an inner end of the at least one cross strut arranged at the centered part of the screed body partition, the cross strut transforming a bending of the screed body partition in horizontal direction into a twisting.

[0023] According to a fourth aspect of the invention, the object is achieved by a paver according to claim 14. The paver has a paving screed according to the first aspect or a paving screed broadening part according to the second aspect or a paving screed extension according to the third aspect of the invention.

[0024] As to the advantages, preferred embodiments and details of the paving screed extension, the paver broadening part and the paver, reference is made to the corresponding aspect and embodiments described herein above with respect to the paving screed.

[0025] Further advantages and advantageous features of the invention are disclosed in the following description and in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] With reference to the appended drawings, below follows a more detailed description of embodiments of the invention cited as examples.

[0027] In the drawings

Fig. 1 is a schematic view of an embodiment of a paver according to the fourth aspect of the invention,

Fig. 2 is a schematic view of an embodiment of a screed body partition according to the invention,

Fig. 3 is a schematic view of a further embodiment of a screed body partition according to the invention,

Fig. 4A is a schematic view of a further embodiment of a screed body partition according to the invention,

Fig. 4B is a schematic detail view of the stabilizing angle sheet of the screed body partition of Fig. 4A.

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS OF THE INVENTION

[0028] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. The invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein;

rather, these embodiments are provided for thoroughness and completeness. The skilled person will recognize that many changes and modifications may be made within the scope of the appended claims.

[0029] Like reference character refer to like elements throughout the description.

[0030] Fig. 1 illustrates an embodiment of a paver 1 with a paving screed 2 according to the invention. Details of the paving screed construction especially regarding a cross strut will be discussed and shown with respect to Fig. 2 to Fig. 4B. The shown paver is a tracked paver 1 which accordingly comprises caterpillar tracks 9 for providing vehicle propulsion for the paver 1. Furthermore, the paver machine 1 comprises a hopper 3 in which road material is temporarily stored during paving. The road material is typically added to the hopper 3 from a truck. The road material may be asphalt.

[0031] The paver 1 further comprises a paving screed 2 arranged at the rear of the paver 1. The paving screed 2 is arranged to level out road material 4 disposed on the ground 5 in front of the paving screed 2. The road material 4 has been transported from the hopper 3 to the ground via conveyor belts (not shown). The paving screed 2 has several screed body partitions 100. The road material applies forces especially to the front side 101 of each screed body partition 100 causing bending of the screed body partition. With the aid of one cross strut (not shown) in each screed body partition 100 such a bending of the screed body partition 100 in horizontal direction is transformed into a twisting resulting in evenly distributed road material over the full length of the screed body partition and thus also the paving screed. The at least one cross strut therefor extends at a front side 101 of the screed body partition 100 from a centered part 110 to an outer part 120 of the screed body partition. An outer end of the at least one cross strut 200 is arranged at the outer part 120 of the screed body partition and is positioned closer to a bottom side of the paving screed 2 facing a pavement than an inner end of the at least one cross strut 200 being arranged at the centered part 110 of the screed body partition 100. In the shown embodiment each screed body partition 100 has one cross strut, thus the paving screed 2 is built up symmetrically having cross struts on the left and right side of the paving screed 2. In further embodiments also configurations with cross struts in the outer screed body partition are possible for example. The needed number of screed body partitions with cross struts depends on the overall construction and intrinsic stability against bending of the paving screed as well as on the length of the paving screed. The longer the paving screed, the more screed body partitions with cross struts are normally useful to compensate the bending.

[0032] In the shown embodiment of a paver a pressure actuated screed lifting cylinder 6 is arranged to lift and lower the screed 2 with respect to the ground 5. The pressure actuated screed lifting cylinder 6 is connected to a screed lifting arm 7. The screed lifting arm 7 is con-

nected to the screed 2 at an end portion of the lifting screed lifting arm 7. A further pressure actuated screed levelling cylinder 13 is arranged further to the front of the paver 1 than the pressure actuated screed lifting cylinder 6. The pressure actuated screed levelling cylinder 13 is pivotally connected to the screed lifting arm 7 at its other end portion.

[0033] Fig. 2 illustrates an embodiment of a screed body partition 100 according to the invention. The screed body partition 100 can be part of a paving screed 2 as well as part of a paving screed extension or a paving screed broadening part. The screed body partition 100 has one cross strut herein extending at a back side 102 of the screed body partition 100 from a centered part 110 to an outer part 120 of the screed body partition. An outer end 220 of the cross strut 200, which is arranged at the outer part 120 of the screed body partition, is positioned closer to a bottom side 105 of the paving screed 2 facing a pavement than an inner end 210 of the cross strut 200 arranged at the centered part 110 of the screed body partition 100. The cross strut 200 transforms a bending of the screed body partition 100 in horizontal direction into a twisting. The cross strut 200 in the shown embodiment is a massive and has a rectangular cross-section. The inner end 210 of the cross strut 200 is in the shown embodiment arranged at a position higher than a torsional centre of the screed body partition 100 and the outer end 220 of the at least one cross strut 200 is arranged at a position lower than the torsional centre of the screed body partition 100. In the shown embodiment the cross strut extends in a plane parallel to a front side 101 of the screed body partition. Alternatively the at least cross strut could further extend from a plane nearer to the front side to a plane nearer to a back side of the screed body partition.

[0034] Fig. 3 shows a further embodiment of a screed body partition 300 according to the invention. The screed body partition is mainly constructed as the screed body partition 100 of Fig. 2. Therefore in the following merely the differences are described. The screed body partition 300 has a stabilizing angle sheet 130 extending from the centered part 110 of the screed body partition to the outer part 120 of the screed body partition. In the shown embodiment the cross sheet 130 has a recess 131. The recess 131 improves twisting by the cross strut 200 while on the other hand further stabilizing the screed body partition 300.

[0035] Fig. 4A illustrates a further embodiment of a screed body partition 400 according to the invention. The cross strut 240 in the shown embodiment is an integral part of a sheet element of the screed body partition 100, here of a stabilizing angle sheet 140 of the screed body partition 400. The cross strut 240 here also extends at a back side 102 of the screed body partition 100 from a centered part 110 to an outer part 120 of the screed body partition. The outer end 220 of the at least one cross strut 200, which is arranged at the outer part 120 of the screed body partition, is positioned closer to a bottom side 105

of the paving screed 2 facing a pavement than the inner end 210 of the cross strut 200 arranged at the centered part 110 of the screed body partition 100. The cross strut 240 herein is arranged at an angle 10° with respect to the bottom side 105 of the paving screed 2. The cross strut 240 transforms a bending of the screed body partition 100 in horizontal direction into a twisting. This is further supported via the recess 141 in the stabilizing angle sheet 140. With the integration of the cross strut 240 in the stabilizing angle sheet 141 the installation space in the screed body partition can be exploited optimally. Fig. 4B is a schematic detail view of the stabilizing angle sheet 140 of the screed body partition 400 of Fig. 4A. In the detail view the arrangement of recess 141 and cross strut 240 can be seen. The cross strut 240 can be built via removing material of the stabilizing angle sheet 140, for example via cutting before bending the sheet.

Reference signs

[0036]

1	paver
2	paving screed
3	hopper
4	road material
5	ground
6	screed lifting cylinder
7	screed lifting arm
9	caterpillar tracks
13	screed levelling cylinder
100	screed body partition
101	front side
102	backside
105	bottom side
110	inner part
120	outer part
130	stabilizing angle sheet
131	recess
140	stabilizing angle sheet
141	recess
200	cross strut
210	inner end
220	outer end
240	cross strut
300	screed body partition
400	screed body partition

Claims

1. Paving screed (2) having at least one screed body partition (100), the at least one screed body partition (100) having at least one cross strut (200) extending at a front side (101) or at a back side (102) of the screed body partition (100) from a centered part (110) to an outer part (120) of the screed body partition, wherein an outer end (220) of the at least one

cross strut (200) arranged at the outer part (120) of the screed body partition is positioned closer to a bottom side (105) of the paving screed (2) facing a pavement than an inner end (210) of the at least one cross strut (200) arranged at the centered part (110) of the screed body partition (100), the cross strut (200) transforming a bending of the screed body partition in horizontal direction into a twisting.

2. Paving screed (2) according to claim 1, wherein the inner end (210) of the at least one cross strut (200) is arranged at a position higher than a torsional centre of the screed body partition (100) and the outer end (220) of the at least one cross strut (200) is arranged at a position lower than the torsional centre of the screed body partition (100).

3. Paving screed (2) according to any of the preceding claims, wherein the at least cross strut (100) further extends from a plane nearer to the front side (101) to a plane nearer to a back side (102) of the screed body partition or extends in a plane parallel to a front side (101) of the screed body partition.

4. Paving screed (2) according to any of the preceding claims wherein the screed body partition (100) is a main single screed section or one section of a main multiple sections screed or a screed extension, which is arranged behind and adjacent to a main screed section or a screed broadening part, which is arranged flanking to a main screed section.

5. Paving screed (2) according to any of the preceding claims having multiple sections, wherein each of the multiple sections has at least one cross strut (200).

6. Paving screed (2) according to any of the preceding claims, wherein the at least one cross strut (200) is arranged at an angle in the range of 10 to 85° with respect to the bottom side (105) of the paving screed (2).

7. Paving screed (2) according to any of the preceding claims, wherein the at least one cross strut (200) comprises several single struts.

8. Paving screed (2) according to any of claims 1 to 6, wherein the at least one cross strut (200) is massive or has a hollow structure and has a round, oval or polygonal cross-section.

9. Paving screed (2) according to any of the preceding claims, wherein the cross strut (240) is an integral part of a sheet element (140) of the screed body partition (100), especially of a stabilizing angle sheet (140) of the screed body partition.

10. Paving screed (2) according to any of the preceding

claims having a stabilizing angle sheet (130, 140) extending from the centered part of the screed body partition to the outer part of the screed body partition, wherein the cross sheet (130, 140) has at least one recess (131, 141).

5

11. Paving screed (2) according to any of the preceding claims having two screed body partitions (100) with at least one cross strut (200), wherein the paving screed is built up symmetrically and one of the two screed body partitions with at least one cross strut is arranged in a left part of the paving screed while the other is arranged in a corresponding right part of the paving screed.
10
15
12. Paving screed extension able to be arranged behind and adjacent to a main screed section and having at least one screed body partition (100), the at least one screed body partition having at least one cross strut (200) extending at a front side or at a back side of the screed body partition from a centered part to an outer part of the screed body partition, wherein an outer end of the at least one cross strut arranged at the outer part of the screed body partition is positioned closer to a bottom side of the screed facing the pavement than an inner end of the at least one cross strut arranged at the centered part of the screed body partition, the cross strut transforming a bending of the screed body partition in horizontal direction into a twisting.
20
25
30
13. Paving screed broadening part able to be arranged flanking to a main screed section and having at least one screed body partition, the at least one screed body partition (100) having at least one cross strut (200) extending at a front side or at a back side of the screed body partition from a centered part to an outer part of the screed body partition, wherein an outer end of the at least one cross strut arranged at the outer part of the screed body partition is positioned closer to a bottom side of the screed facing the pavement than an inner end of the at least one cross strut arranged at the centered part of the screed body partition, the cross strut transforming a bending of the screed body partition in horizontal direction into a twisting.
35
40
45
14. Paver (1) having a paving screed (2) according to any of the claims 1 to 11 or a paving screed broadening part according to claim 12 or a paving screed extension according to claim 13.
50

55

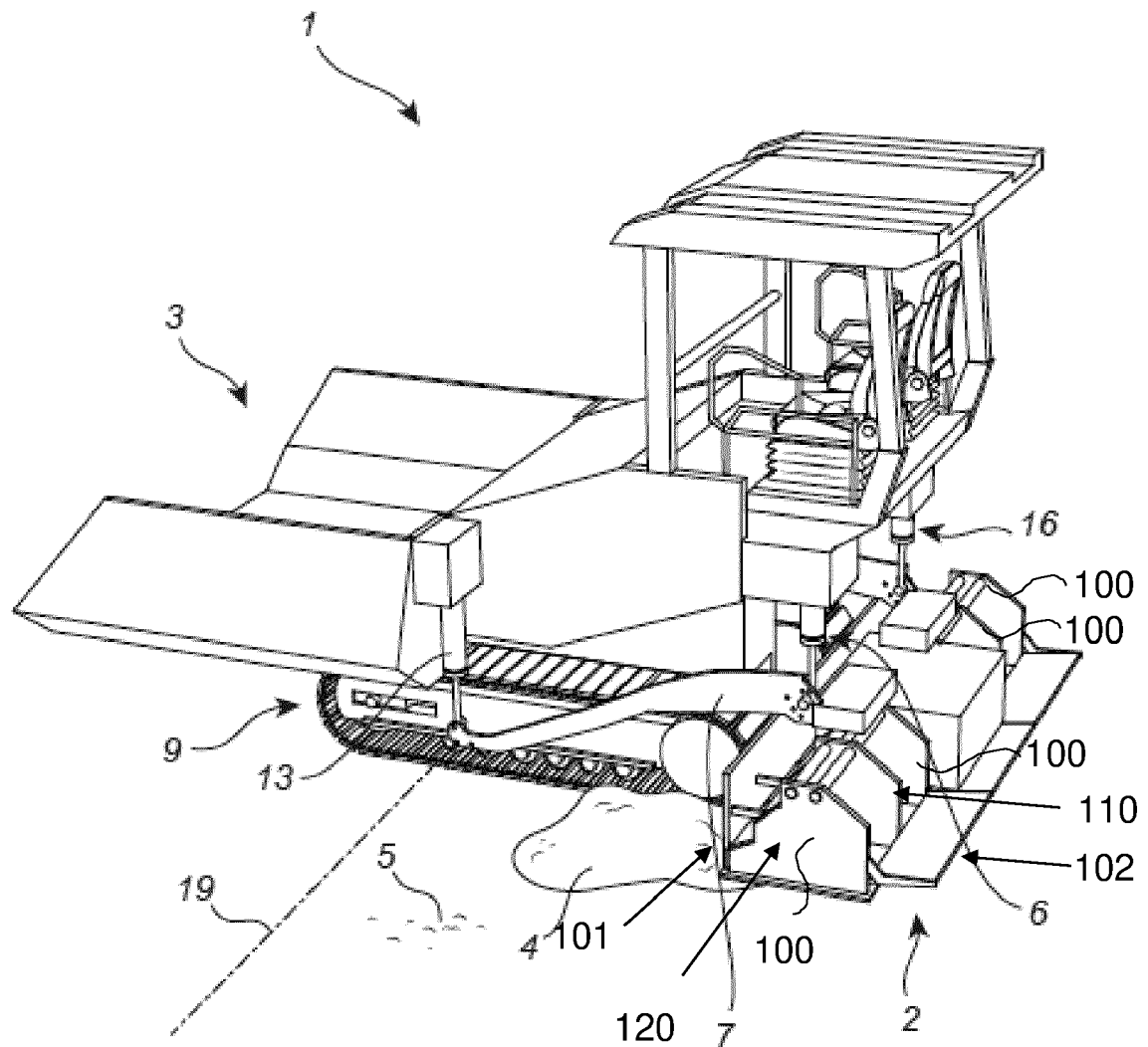


Fig. 1

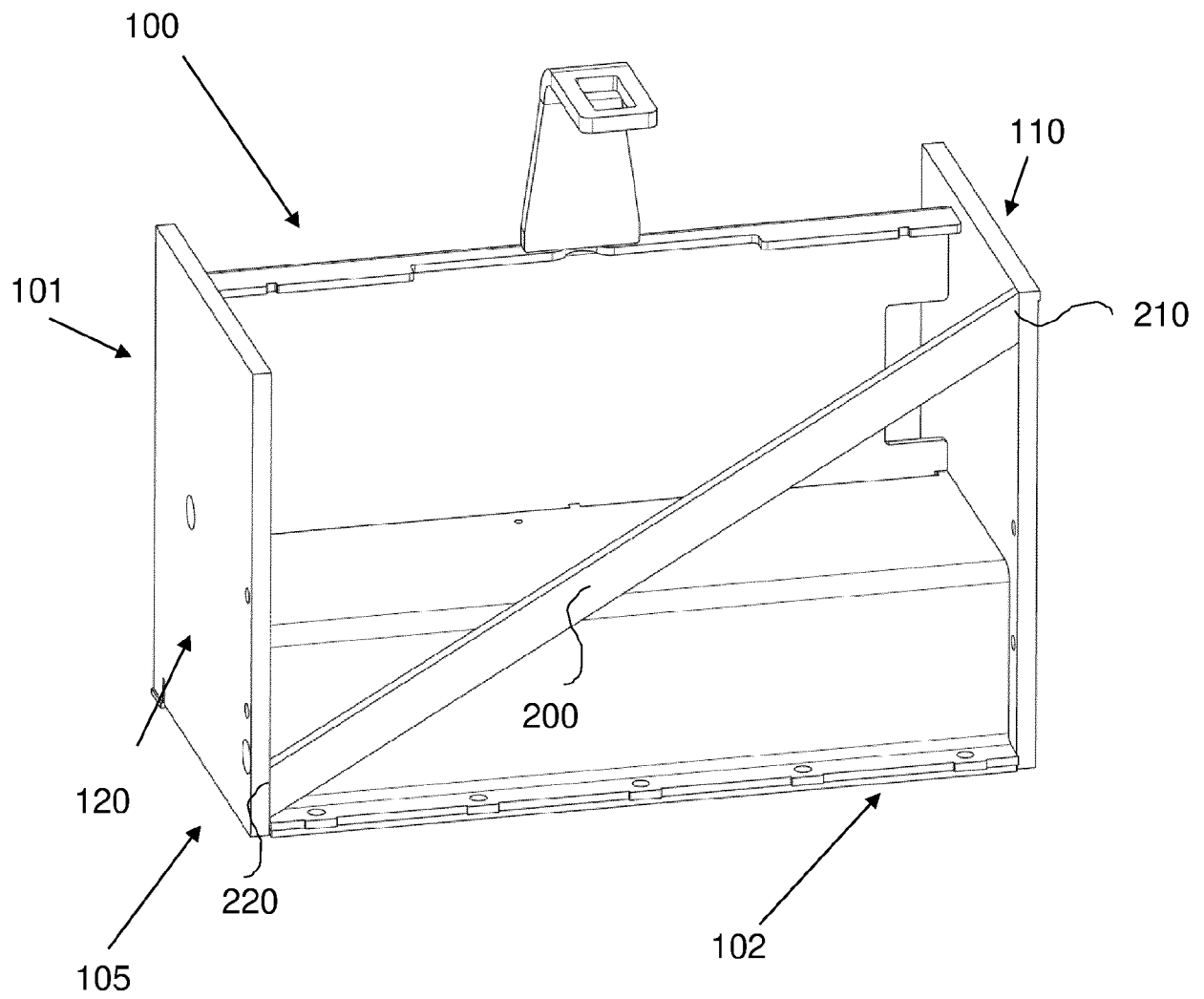


Fig. 2

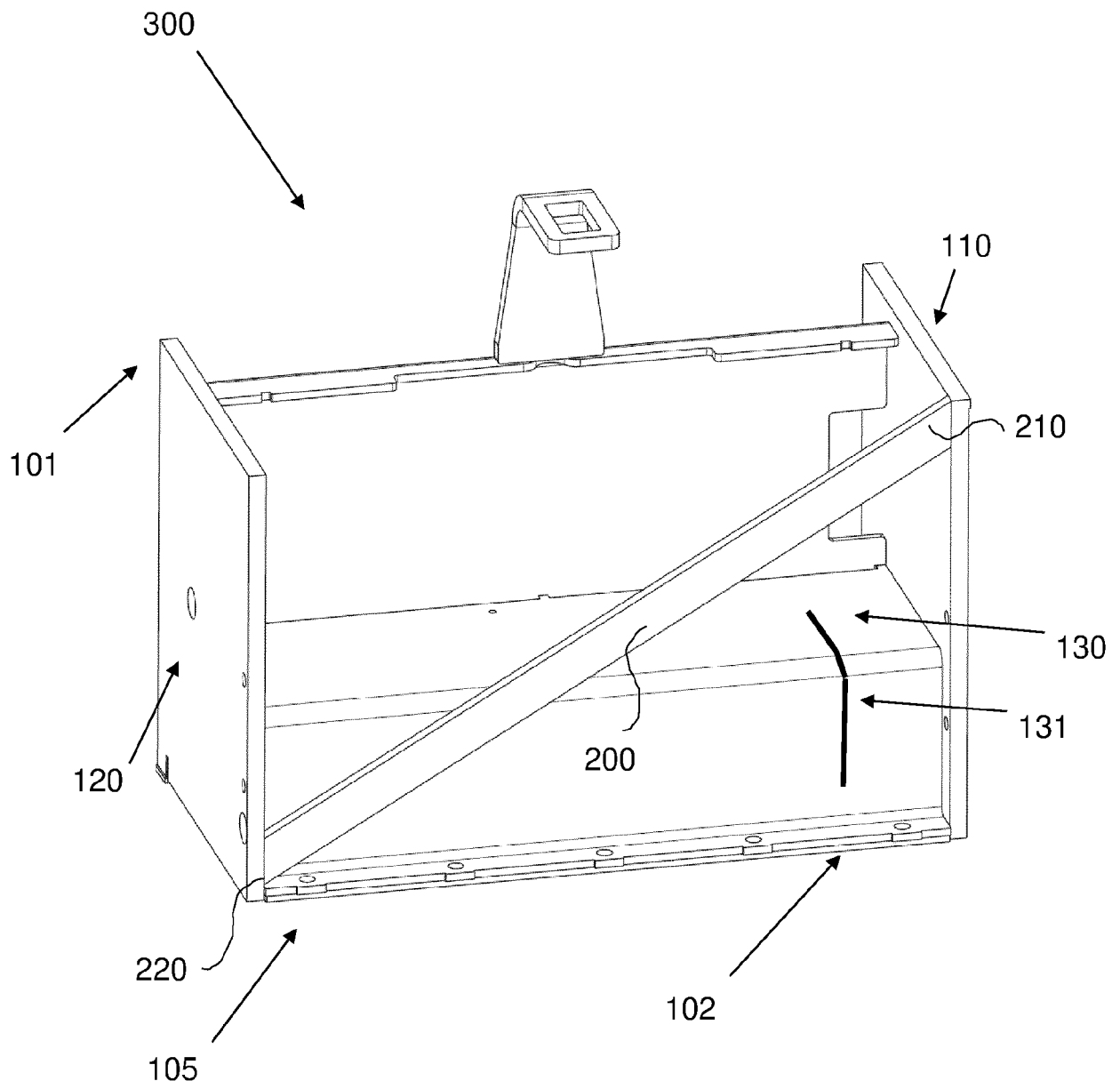
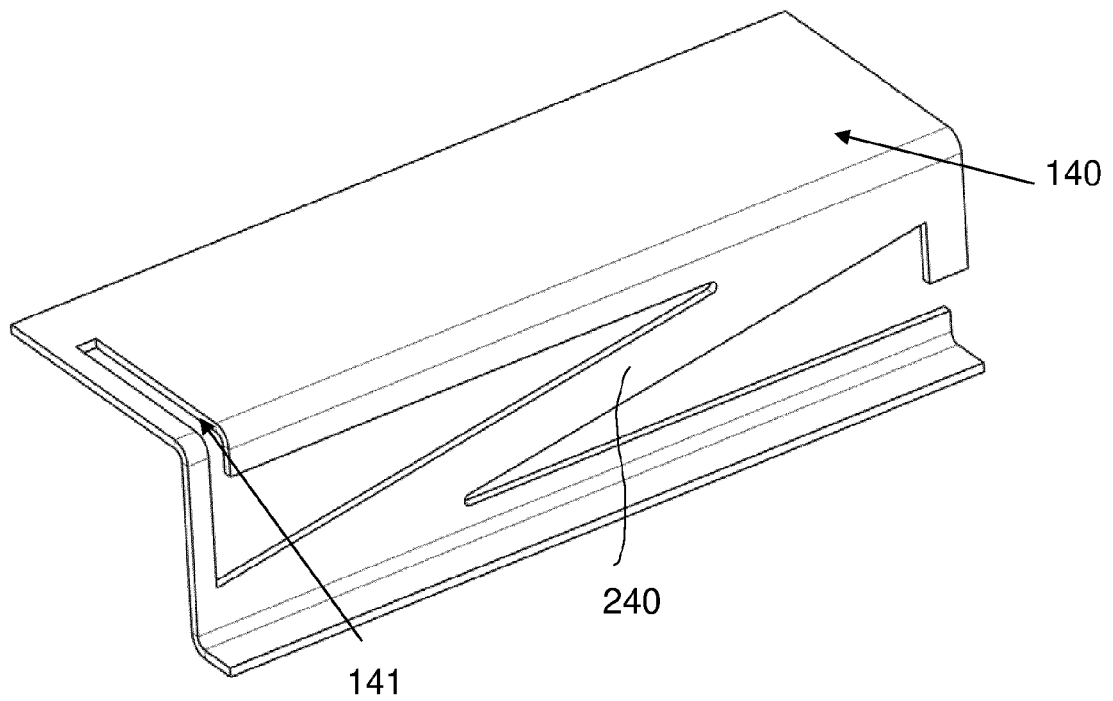
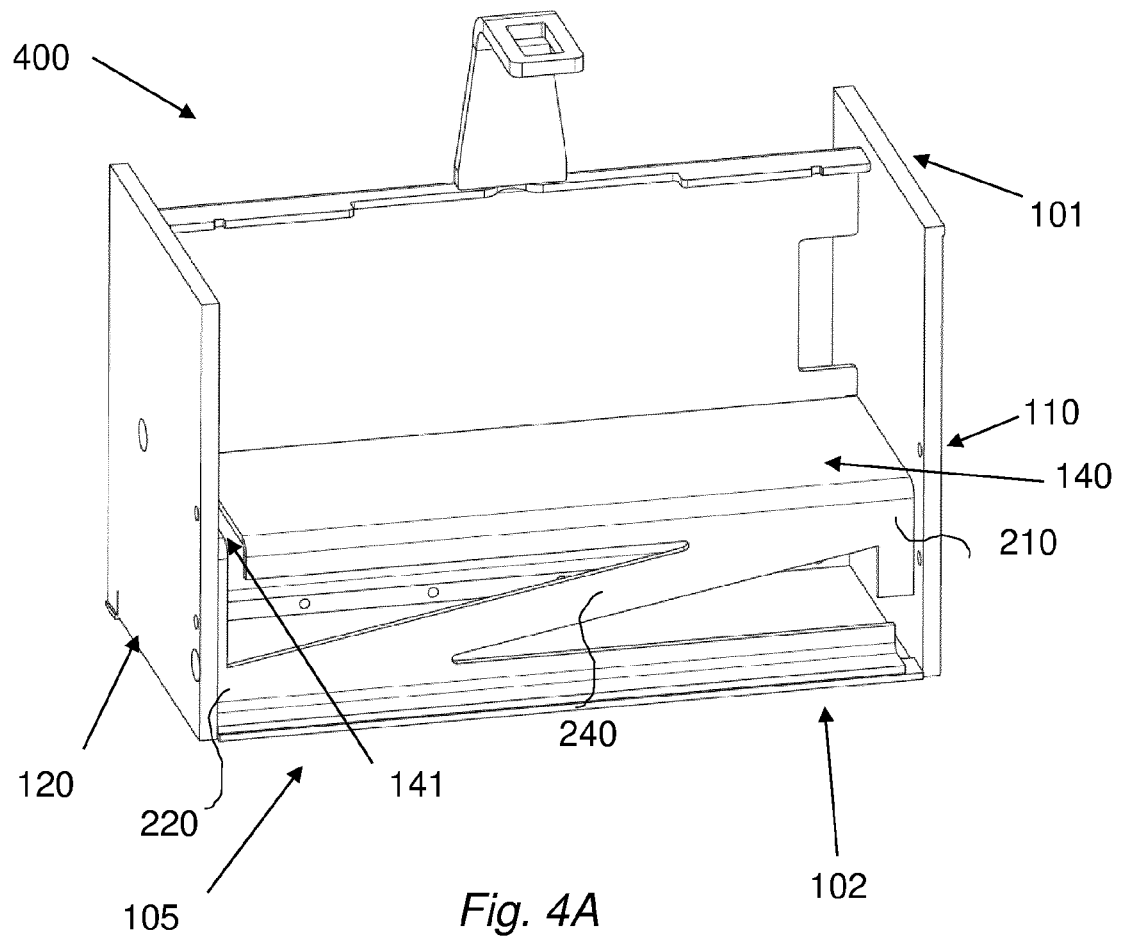


Fig. 3





EUROPEAN SEARCH REPORT

Application Number

EP 22 17 3776

5

10

15

20

25

30

35

40

45

50

55

1

EPO FORM 1503 03.82 (P04C01)

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	US 4 806 047 A (MORRISON DONALD R [US]) 21 February 1989 (1989-02-21) * figures 1,2 * * the whole document *	1-14	INV. E01C19/48
A,D	CN 102 864 726 A (ZOOMLION HEAVY IND SCI & TECH) 9 January 2013 (2013-01-09) * figure 1 * * the whole document *	1-14	
A,D	CN 203 821 207 U (HUNAN SANY ROAD MACHINERY CO LTD) 10 September 2014 (2014-09-10) * figures 1-7 * * the whole document *	1-14	
			TECHNICAL FIELDS SEARCHED (IPC)
			E01C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 October 2022	Examiner Klein, A
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	

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

EP 22 17 3776

5 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.

15-10-2022

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
	US 4806047 A	21-02-1989	NONE	

15	CN 102864726 A	09-01-2013	NONE	

	CN 203821207 U	10-09-2014	NONE	

20				
25				
30				
35				
40				
45				
50				
55				

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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

- CN 102864726 [0005]
- CN 203821207 [0006]