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(54) Snow plough and blade bench of snow plough

(57) A blade bench (3) of a snow plough (1), comprising a frame (4) of the blade bench (3) and a plurality of mutually separate blade holders (5) in a horizontal (H) direction of the blade bench (3), mutually separate wear blades (6) of the snow plough (1) being arrangeable in connection with the blade holders (5). The blade holders (5) are springloaded, allowing the blade holders (5) and

the wear blades (6) to move mutually separately in a vertical (V) direction of the blade bench (3) and to incline mutually separately with respect to the horizontal (H) direction of the blade bench, and in an operating position of the snow plough, the blade holders (5) and the wear blades (6) being in an upward sprung position.

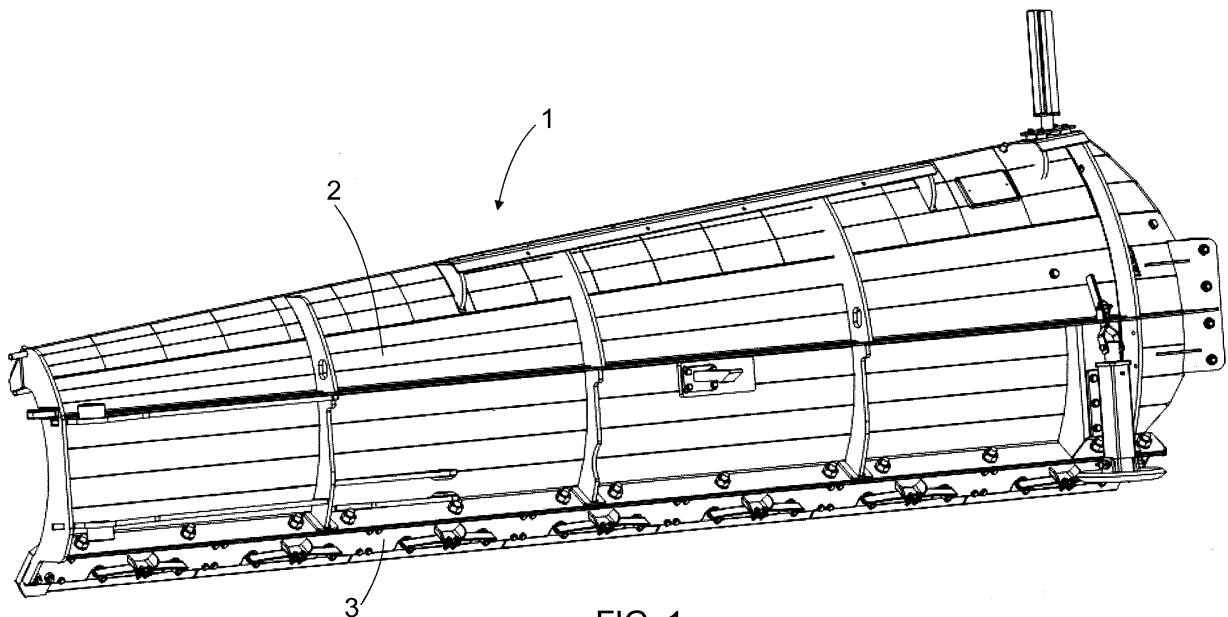


FIG. 1

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Description

Field of the invention

[0001] The invention relates to a snow plough, and particularly to a blade bench of a snow plough.

Field of the invention

[0002] Snow ploughs to be attached, among other things, to lorries or trucks, tractors or other work machines are used for removing snow from roads, streets, parking spaces, airport runways and the like. A snow plough comprises a wing and, in a lower part of the wing, a blade bench to which are fastened blades, also called wear blades, for carrying out detachment of snow and ice from a surface being ploughed.

Brief description of the invention

[0003] An object of the invention is to provide a novel blade bench of a snow plough, and a snow plough.

[0004] The solution according to the invention is characterized by what is disclosed in the independent claims.

[0005] Some embodiments of the invention are disclosed in the dependent claims.

[0006] According to an embodiment, the blade bench of the snow plough comprises a frame of the blade bench and a plurality of mutually separate blade holders in a horizontal direction of the blade bench, mutually separate wear blades of the snow plough being arrangeable in connection with the blade holders, and wherein the blade holders are spring-loaded, allowing the blade holders and the wear blades to move mutually separately in a vertical direction of the blade bench and to incline mutually separately with respect to the horizontal direction of the blade bench, and wherein in an operating position of the snow plough, the blade holders and the wear blades are in an upward sprung position.

[0007] When the blade bench comprises in the horizontal direction a plurality of mutually separate blade holders and wear blades which are allowed to move in the vertical direction mutually separately, i.e. irrespectively of the other blade holders and the wear blades associated therewith, the blades of the snow plough are capable of following closely the surface to be ploughed and possible rough spots therein, thus enabling the snow collected on the surface to be ploughed to be removed efficiently, regardless of any roughness therein.

[0008] When the blade holders and the wear blades provided in connection therewith are in the operating position of the snow plough in the upward sprung position, a spring force presses the blade holders and the wear blades provided in connection therewith downwards, against the surface to be ploughed. When a wear blade comes to reside at a groove or some such rough spot in the surface to be ploughed, the wear blade moves down to the bottom of the groove or some such rough spot,

thus following the surface to be ploughed due to the influence of the spring force pressing the wear blade downwards. In such a case, the groove or some such rough spot may be cleaned of snow all the way down to its bottom, without any snow remaining therein to become transformed into ice later. Consequently, the ploughing quality and result remain good on a surface comprising grooves or some such rough spots.

[0009] Similarly, when the snow plough meets a protrusion in the surface to be ploughed, one or more wear blades residing at the protrusion are allowed to move up, irrespectively of the other wear blades, while wear blades that do not meet the particular protrusion remain pressed against the surface to be ploughed. If the play of the wear blade upwards is insufficient, the entire plough moves up and wear blades remaining outside the protrusion are pressed downwards due to the influence of the spring force. Consequently, the ploughing quality and result remain good and excellent also on a surface comprising protrusions.

[0010] Further, when the blade holder and the wear blade associated therewith are allowed to incline with respect to the horizontal direction of the blade bench, irrespectively of the other blade holders and the wear blades associated therewith, the wear blades are also allowed to follow possible inclinations in the surface to be ploughed, in which case the ploughing quality and result remain good and excellent also on a surface comprising inclinations.

[0011] According to an embodiment of the blade bench, the blade bench comprises slot elements arranged in connection with the frame of the blade bench and provided with a slot, and the blade holders comprise brackets arranged in the slots, said slots forming a structure controlling the movement and inclination of the blade holders.

[0012] According to an embodiment of the blade bench, a flexible element used for producing spring load is a leaf spring directed in the horizontal direction of the blade bench, and the blade holder is arranged in connection with the leaf spring by means of at least two support elements arranged to be pressed in the vertical direction of the blade bench against the leaf spring at substantially opposite ends of the leaf spring.

[0013] According to an embodiment of the blade bench, the leaf spring is supported on the frame of the blade bench in the horizontal direction of the blade bench by means of a fastener located substantially centrally on the leaf spring, the fastener forming a fixed pivot point to allow the blade holder and the wear blade provided in connection therewith to incline with respect to the horizontal direction of the blade bench.

[0014] According to an embodiment of the blade bench, the blade holders are arranged on a front side of the frame of the blade bench while the flexible elements producing spring load are arranged on a rear side of the frame of the blade bench.

[0015] According to an embodiment of the blade

bench, the blade bench comprises a wear element arranged between the frame of the blade bench and the blade holder in order to reduce wear of the frame of the blade bench when the blade holder moves with respect to the frame of the blade bench.

[0016] According to an embodiment, the snow plough comprises a wing and a blade bench, wherein the blade bench is a blade bench as claimed in any one of claims 1 to 6.

[0017] According to an embodiment of the snow plough, the blade bench is fastened to the wing detachably.

[0018] According to an embodiment of the snow plough, the snow plough is a side plough.

Brief description of the figures

[0019] The invention is now described in closer detail in connection with preferred embodiments and with reference to the accompanying drawings, in which:

Figure 1 schematically shows a snow plough as viewed from behind,

Figure 2 schematically shows a front diagonal view of a blade bench of a snow plough according to Figure 1,

Figure 3 schematically shows a rear diagonal view of the blade bench of a snow plough according to Figure 1,

Figure 4 schematically shows a front diagonal view of a detail of the blade bench of a snow plough according to Figure 1, and

Figure 5 schematically shows a partially exploded front diagonal view of the blade bench of a snow plough according to Figure 1.

[0020] For the sake of clarity, the figures show some embodiments of the invention in a simplified manner. In the figures, like reference numerals identify like elements.

Detailed description of the invention

[0021] Figure 1 schematically shows a snow plough 1 as viewed from behind. The snow plough 1 may be attached, for instance, to lorries or trucks, tractors or another work machine in order to remove snow from roads, streets, parking spaces, airport runways or the like. The snow plough 1 comprises a wing 2 and a blade bench 3 fastened to a lower part of the wing 2.

[0022] Figure 2 schematically shows a front diagonal view of the blade bench 3 according to Figure 1, Figure 3 schematically shows a rear diagonal view of the blade bench 3 according to Figure 1, Figure 4 schematically shows a front diagonal view of a detail of the blade bench 3 according to Figure 1, and Figure 5 schematically shows a partially exploded front diagonal view of the blade bench 3 according to Figure 1.

[0023] Referring to Figures 2 to 5, the blade bench 3 comprises a frame 4 having a front side 4' to be facing forwards, and a rear side 4" to be facing backwards. The blade bench 3 further comprises in a horizontal direction H of the blade bench 3 a plurality of successive, mutually separate blade holders 5 arranged on the side of the front side 4' of the frame 4 of the blade bench 3 such that they are allowed to move mutually separately in a vertical direction V of the blade bench 3. Blades 6, i.e. wear blades 6, for carrying out detachment of snow and ice from the surface to be ploughed are fastened in connection with the blade holders 5, in which case the blade bench 3 comprises in the horizontal direction H a plurality of successive, mutually separate wear blades 6 which are allowed to move mutually separately in the vertical direction V of the blade bench 3. Herein, the vertical direction of the blade bench refers to a direction oriented upwards from the surface to be ploughed which converges with the direction of the wear blade 6 when viewing the wear blade in the vertical direction of the snow plough. Typically, the wear blades 6 are arranged slightly aslant with respect to the absolute vertical direction. The direction of the wear blade 6 may be determined by a blade angle, which indicates an angle between the wear blade and the surface to be ploughed. The vertical movement of the blade holders 5 and the wear blades 6 to be fastened in connection therewith is implemented in a spring-loaded manner. Spring loading is produced by flexible elements which enable both the mutually separate vertical movement of the blade bench 3 and the mutually separate inclination with respect to the horizontal direction of the blade bench 3 of the in the horizontal direction H of the blade bench 3 successive, mutually separate blade holders 5 and the wear blades 6 to be fastened in connection therewith.

[0024] In the solution according to Figures 2 to 5, the flexible elements are leaf springs 8 fastened to the rear side 4" of the frame 4 of the blade bench 3 such that the leaf spring 8 is directed in the horizontal direction of the blade bench 3 or runs in the horizontal direction of the blade bench 3. The leaf spring 8 is fastened by a fastener 9 to the frame 4 of the blade bench 3 substantially at its centre in the horizontal direction of the blade bench 3 such that ends 8a and 8b of the leaf spring 8 remain free with respect to the frame 4 of the blade bench 3. The number of leaf springs 8 provided in the horizontal direction of the blade bench 3 equals the number of blade holders 5, i.e. the blade bench 3 is provided with a leaf spring 8 associated with each blade holder 5.

[0025] The blade holder 5 is arranged in the blade bench 3 by means of slot elements 10 which, in the solution according to Figures 2 to 5, are fastened to the front side 4' of the frame 4 of the blade bench 3 such that a slot 11 of the slot element 10 is directed towards the front side 4' of the frame 4 of the blade bench 3. The slot elements 10 are placed in the blade bench 3 in the horizontal direction thereof such that a slot element 10 comes to reside at each end 5a, 5b of the blade holders

5, in which case when assembling the blade bench 3, a bracket 12 provided at each end 5a, 5b of the blade holders 5 and directed outwards from the end of the blade holders settles in the slot 11. In such a case, the slot elements 10 support the blade holder 5 on the blade bench 3 while at the same time the slots 11 form vertical grooves in which the brackets 12 provided at the ends 5a, 5b of the blade holders 5 are allowed to move in the vertical direction of the blade bench 3 within the extreme limits determined by ends 11 a, 11b of the slot 11, thereby enabling the blade holder 5 and the wear blade 6 to move in the vertical direction of the blade bench 3 within the extreme limits determined by the ends of the slot. The slot elements 10 may be fastened to the frame 4 of the blade bench 3 by screws 13 and washers 14, for instance.

[0026] The blade holder 5 is arranged in connection with the leaf spring 8 by means of support elements 15. To be more precise, the arrangement according to Figures 2 to 5 includes widened bores 16 formed in a lower part of the frame 4 of the blade bench 3, below the ends 8a, 8b of the leaf spring 8, through which the support elements 15 are arranged to pass in a direction between the front side 4' and the rear side 4" of the frame 4 of the blade bench 3. The support element 15 is arranged in connection with the blade holder 5 for instance such that a fastening screw 17 is arranged to run from a direction of the front side 4' of the frame 4 of the blade bench 3 in a direction of the rear side 4" of the frame 4 of the blade bench 3, through the wear blade 6 and the blade holder 5 and extending all the way to the support element 15 such that the fastening screw 17 connects the wear blade 6, the blade holder 5 and the support element 15 to one another, into one structure. The fastening screw 17 and a nut 19 fasten the wear blade 6 to the blade holder 5. In a direction of the fastening screw 17, the support element 15 provides a support surface for the leaf spring 8. The support element 15 is wound in to the fastening screw 17, in which case the support element 15 provides the ends 8a, 8b of the leaf spring 8 with a support surface which supports the end 8a, 8b of the leaf spring from below the leaf spring 8.

[0027] The blade bench 3 is fastened for instance by screw fastening or some other fastening manner detachably to the wing 2 of the snow plough 1. Alternatively, the blade bench 3 may be a fixed part of the plough 1. When using the snow plough 1, the blade holders 5 are allowed to move mutually separately in the vertical direction of the blade bench 3 within the limits determined by the slots 11 of the slot elements 10, the lower end 11 a of the slot 11 of the slot element 10 determining the maximum limit of movement of the blade holder 5 with respect to the frame 4 of the blade bench 3 downwards. The upper end 11 b of the slot 11 of the slot element 10, in turn, determines the maximum limit of movement of the blade holder 5 upwards. The widened bore 16 is, in turn, dimensioned such that a total length of travel determined by the lower and upper ends 11 a, 11 b of the slots 11 of the slot elements 10 is available.

[0028] The fastener 9 of the leaf spring 8 forms a fixed pivot point between the ends 8a, 8b of the leaf spring 8, as a consequence of which the support elements 15 located at the opposite ends 8a, 8b of the leaf spring 8 are allowed to move in the vertical direction of the blade bench 3, irrespectively of one another. Taking also into consideration that since the blade holders 5 are arranged by means of the slot elements 10 in the blade bench 3, which results in clearances between adjacent blade holders 5, this means that the blade holder 5 and the wear blade 6 associated therewith are allowed to incline with respect to the horizontal direction of the blade bench 3, irrespectively of the other blade holders and the wear blades associated therewith, and thus to follow inclinations possibly provided in the surface to be ploughed.

[0029] The blade holders 5 are arranged by means of the support elements 15 to be in connection with the corresponding leaf springs 8 such that the blade holders 5 and the wear blades 6 in connection therewith are in the operating position of the snow plough 1 in an upward sprung position, i.e. in the operating position of the snow plough 1 the leaf springs 8 are in a strained state and press the blade holders 5 downwards. In such a case, when a wear blade 6 comes to reside at a groove or some such rough spot in the surface to be ploughed, the wear blade 6 moves down to the bottom of the groove or some such rough spot due to the influence of the spring force pressing it downwards.

[0030] Further, when the snow plough 1 meets a protrusion in the surface to be ploughed, one or more wear blades 6 residing at the protrusion are allowed to move up, irrespectively of the other wear blades 6, against the spring load produced by the leaf spring 8 and within the limits of the slot 11. The wear blades 6 that do not meet said protrusion, in turn, remain pressed against the surface to be ploughed. Consequently, the ploughing quality and result remain good and excellent.

[0031] The leaf spring 8, the slot 11 and the widened bore 16 may be dimensioned or adapted in relation to one another such that in the operating position of the snow plough 1 the springing allowance of the wear blades 6 is smaller upwards than it is downwards. This means that in the operating position of the snow plough 1, a significant force resulting from the strained state of the leaf springs 8 and pressing the wear blades 6 downwards is applied to the wear blades to enable the wear blades 6 to descend to the bottom of the groove or some such rough spot in the surface to be ploughed. According to an embodiment, the leaf spring 8, the slot 11 and the widened bore 16 may be dimensioned or adapted in relation to one another such that in the operating position of the snow plough 1 the springing allowance of the wear blade 6 upwards is for instance about 5 mm and downwards for instance about 25 mm, a total springing allowance thus being about 30 mm.

[0032] The above-disclosed solution may be used both in front ploughs and in side ploughs. The disclosed solution is particularly advantageous in ploughs typically

employing a very slight blade angle, for instance of less than 60 degrees, when a blade angle is defined as an angle between a backing surface of the wear blade, i.e. the backwards facing surface of the wear blade, and the surface to be ploughed.

[0033] The wear blades 6 may be for instance hard metal blades, and their width may vary depending for instance on the use, i.e. for instance on the snow plough to which they are applied, i.e. for instance on whether the plough is a front plough or a side plough. With respect to the total length of the blade bench 3, single wear blades may be made quite short, which makes a worn or damaged single wear blade 6 relatively quick and easy to replace by a new one.

[0034] Further, Figure 5 shows a wear element 7, such as for instance a stainless steel plate, which may be placed between the blade holder 5 and the frame 4 of the blade bench 3; to be more precise, between the slot elements 10 and the front side 4' of the frame 4 of the blade bench 3. The wear element 7 reduces friction and prevents wear when the blade holder 5 moves with respect to the surface of the front side 4' of the frame 4 of the blade bench 3.

[0035] Figure 5 further shows a corner piece 22 which is fastened fixedly for instance by screws 20 and nuts 21 to an end of the blade bench 3 to protect the tip of the snow plough 1 and whose outwardly facing edge comprises a bevel 23 at a lower part thereof.

[0036] According to an embodiment, as distinct from the embodiment disclosed in the figures, the leaf spring 8 may be supported on the frame 4 of the blade bench 3 also by means of a fastener 9 located at one end of the leaf spring 8, and the support elements 15 pressing against the leaf spring 8 may be located centrally on the leaf spring 8 as well as at its opposite end, in which case the centrally located support element 15 forms a pivot point for the leaf spring. A one-piece leaf spring may also be divided into two leaf spring sections that are supported on the frame 4 of the blade bench 3 in its horizontal direction substantially at the same point, in which case said leaf spring sections may be considered to have at least one common fulcrum.

[0037] According to an embodiment, the leaf springs 8 shown in Figure 3 may be completed by using coil or cup springs as auxiliary springs by means of fastening members implemented therefor. The leaf springs 8 may also be replaced by using in their place only coil or cup springs by means of fastening members implemented therefor.

[0038] It will be apparent to a person skilled in the art that as technology advances, the basic idea of the invention may be implemented in many different ways. The invention and its embodiments are thus not restricted to the examples described above but may vary within the scope of the claims.

Claims

1. A blade bench (3) of a snow plough (1), comprising a frame (4) of the blade bench (3) and a plurality of mutually separate blade holders (5) in a horizontal direction (H) of the blade bench (3), mutually separate wear blades (6) of the snow plough (1) being arrangeable in connection with the blade holders (5), and at least one flexible element associated with each blade holder (5), the blade holder (5) being arranged in connection with the flexible element such that the blade holders (5) and the wear blades (6) provided in connection therewith are allowed to move mutually separately in a vertical (V) direction of the blade bench (3) and to incline mutually separately with respect to the horizontal (H) direction of the blade bench (3), and wherein in an operating position of the snow plough (1), the blade holders (5) and the wear blades (6) are in an upward sprung position, **characterized in that** the flexible element is a leaf spring (8) directed in the horizontal (H) direction of the blade bench (3), and **in that** the blade holder (5) is arranged in connection with the leaf spring (8) by means of at least two support elements (15).
2. A blade bench (3) as claimed in claim 1, **characterized in that** the blade bench (3) comprises slot elements (10) arranged in connection with the frame (4) of the blade bench (3) and provided with a slot (11), and wherein the blade holders (5) comprise brackets (12) arranged in the slots (11), said slots (11) forming a structure controlling the movement and inclination of the blade holders (5).
3. A blade bench (3) as claimed in claim 1 or 2, **characterized in that** the support elements (15) are arranged to be pressed in the vertical (V) direction of the blade bench (3) against the leaf spring (8) at substantially opposite ends (8a, 8b) of the leaf spring (8).
4. A blade bench (3) as claimed in claim 3, **characterized in that** the leaf spring (8) is supported on the frame (4) of the blade bench (3) in the horizontal (H) direction of the blade bench (3) by means of a fastener (9) located substantially centrally on the leaf spring (8), the fastener (9) forming a fixed pivot point to allow the blade holder (5) and the wear blade (6) provided in connection therewith to incline with respect to the horizontal (H) direction of the blade bench (3).
5. A blade bench (3) as claimed in any one of the preceding claims, **characterized in that** the blade holders (5) are arranged on a front side (4') of the frame (4) of the blade bench (3) while the flexible elements producing spring load are arranged on a rear side (4'') of the frame (4) of the blade bench (3).

6. A blade bench as claimed in claim 5, **characterized in that** the blade bench (3) comprises a wear element (7) arranged between the frame (4) of the blade bench (3) and the blade holder (5) in order to reduce wear of the frame (4) of the blade bench (3) when the blade holder (5) moves with respect to the frame (4) of the blade bench (3). 5
7. A snow plough (1) comprising a wing (2) and a blade bench (3), **characterized in that** the blade bench (3) is a blade bench (3) as claimed in any one of claims 1 to 6. 10
8. A snow plough as claimed in claim 7, **characterized in that** the blade bench (3) is fastened to the wing (2) detachably. 15
9. A snow plough (1) as claimed in claim 7 or 8, **characterized in that** the snow plough (1) is a side plough. 20

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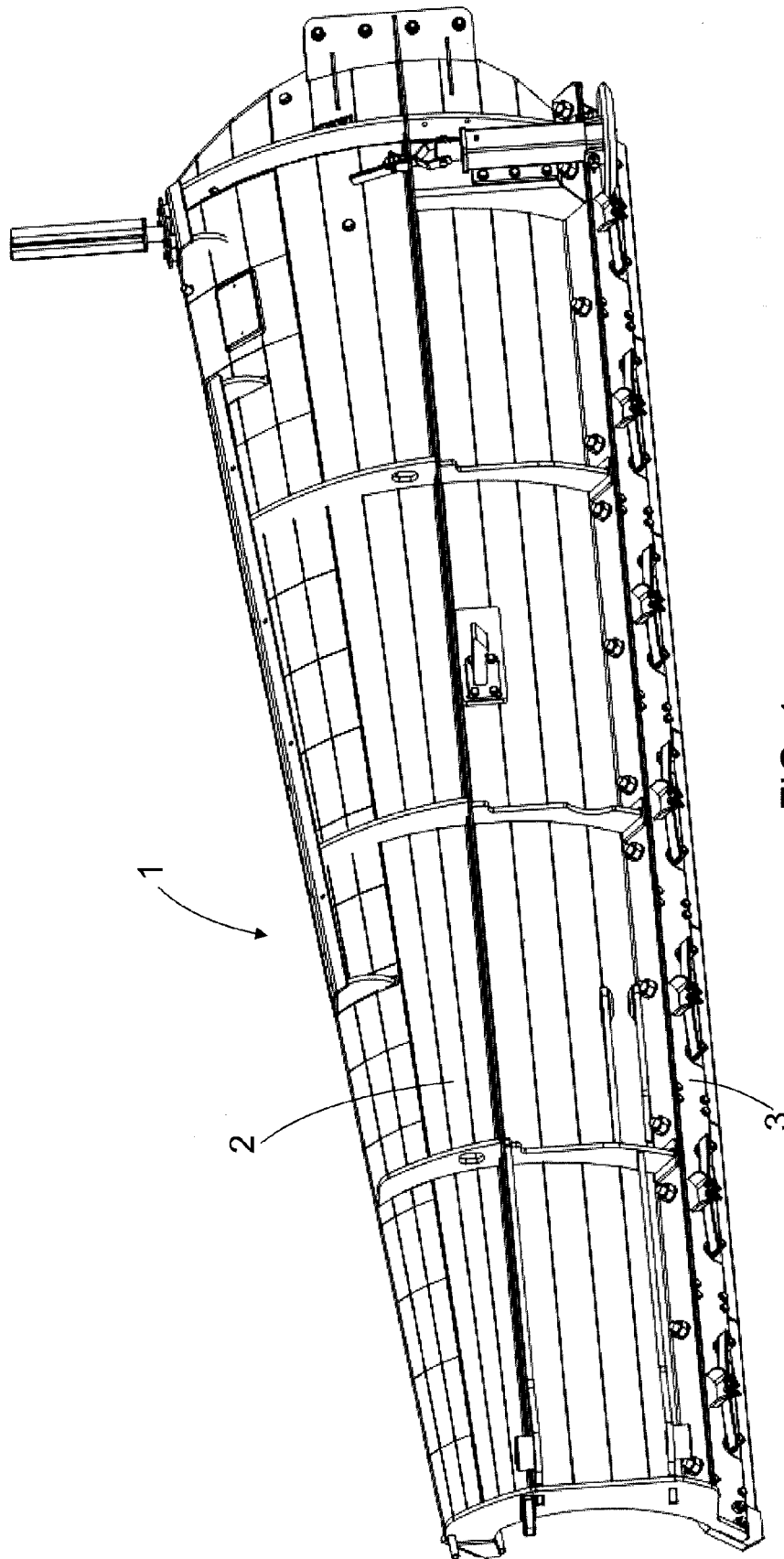
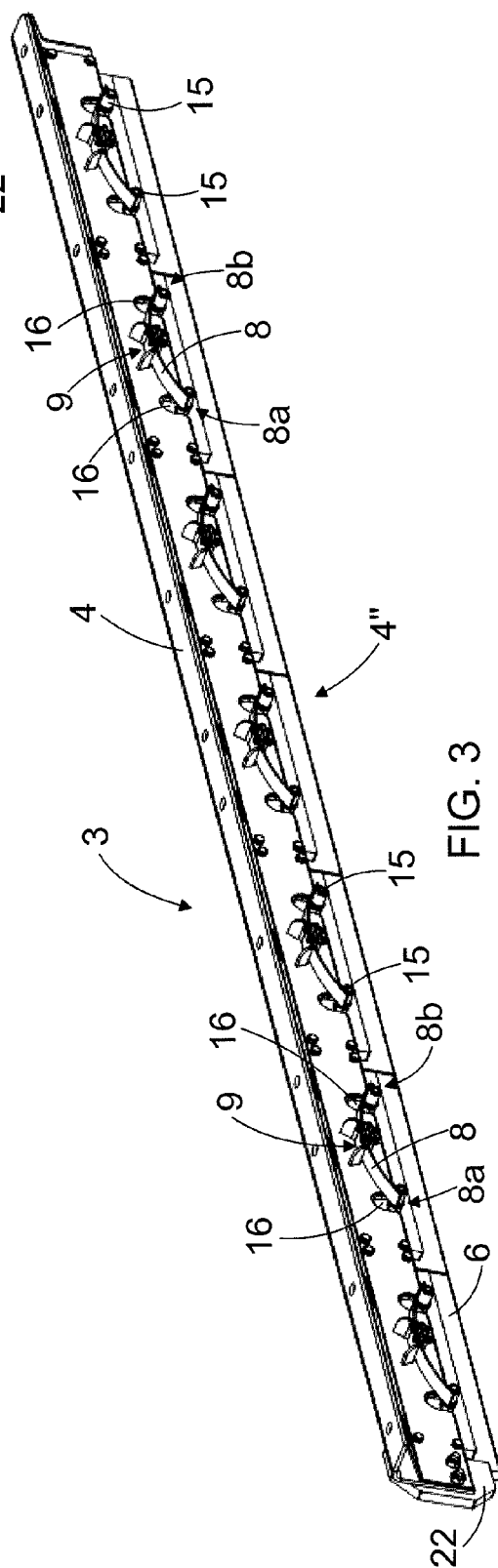
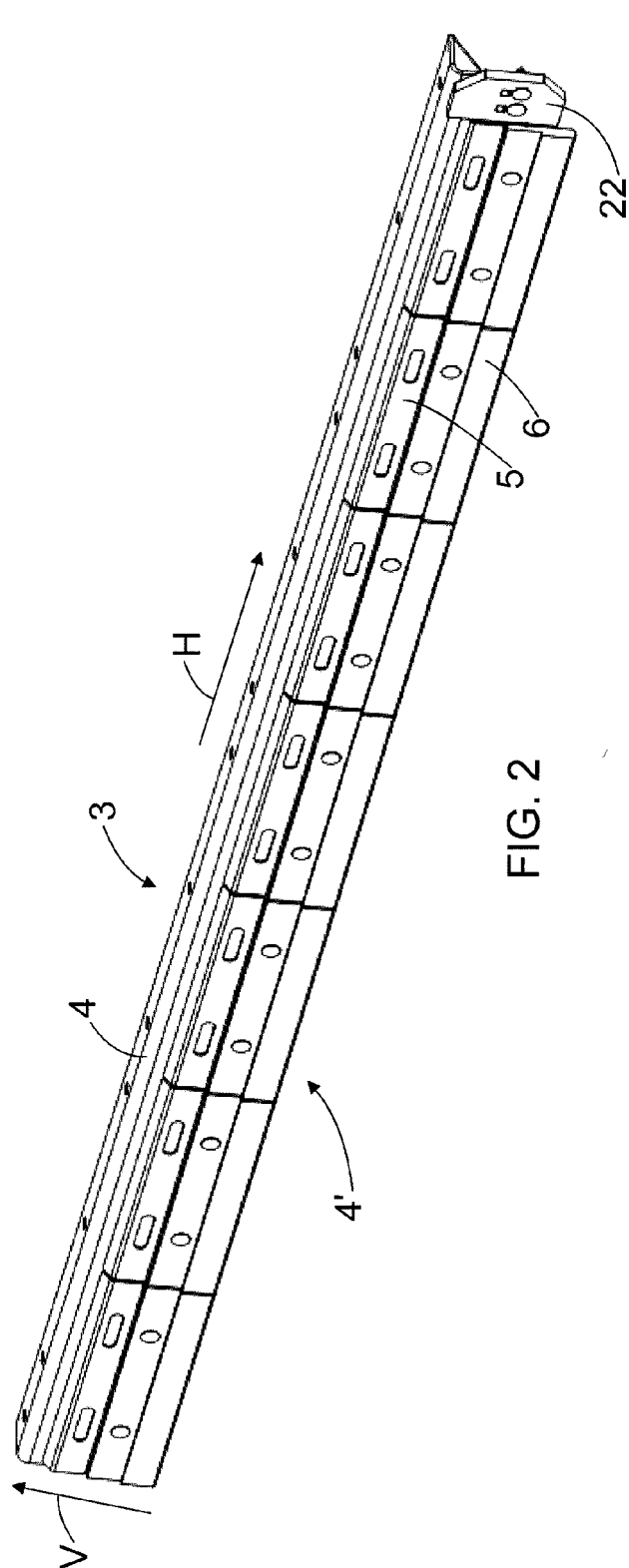


FIG. 1



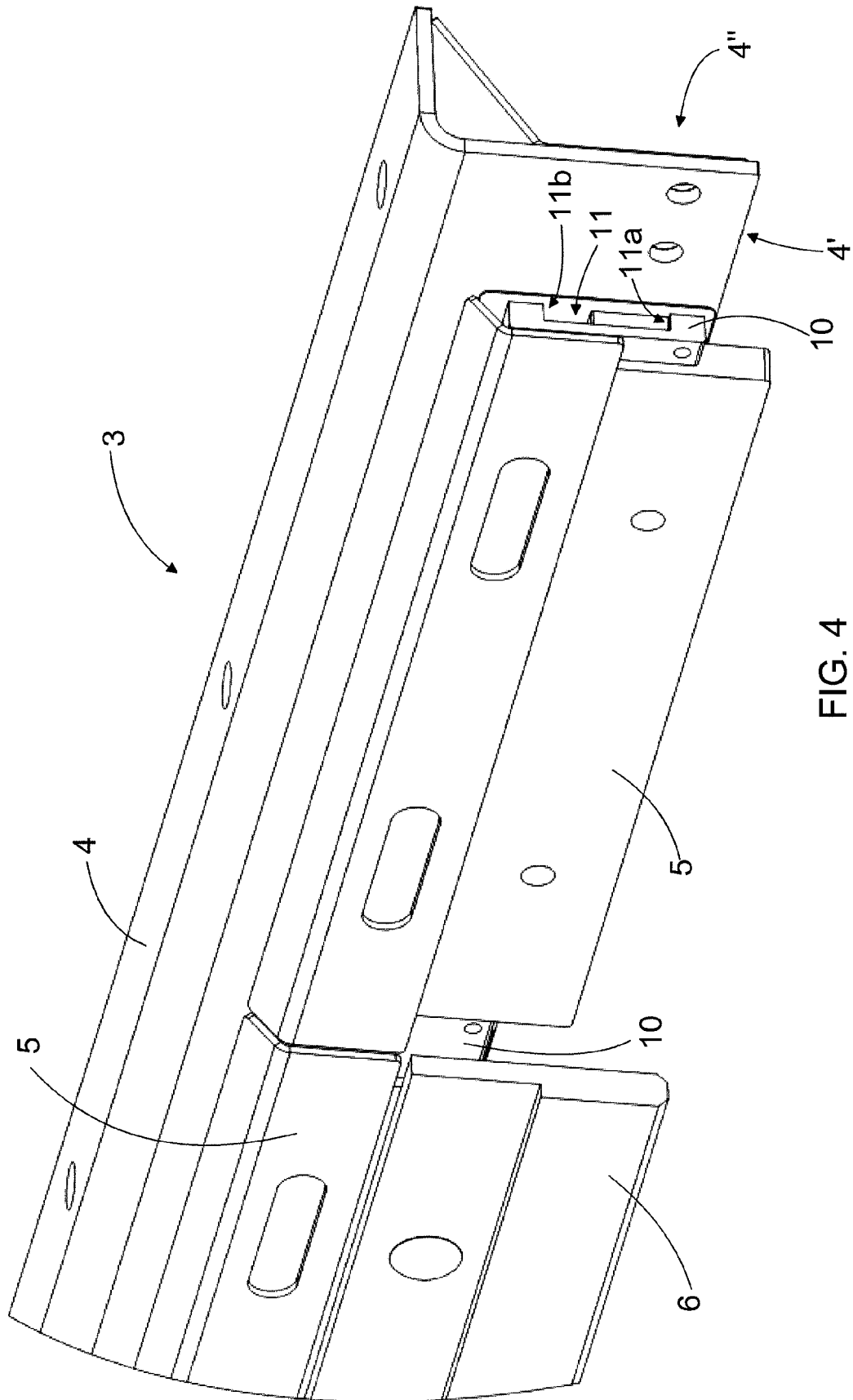


FIG. 4

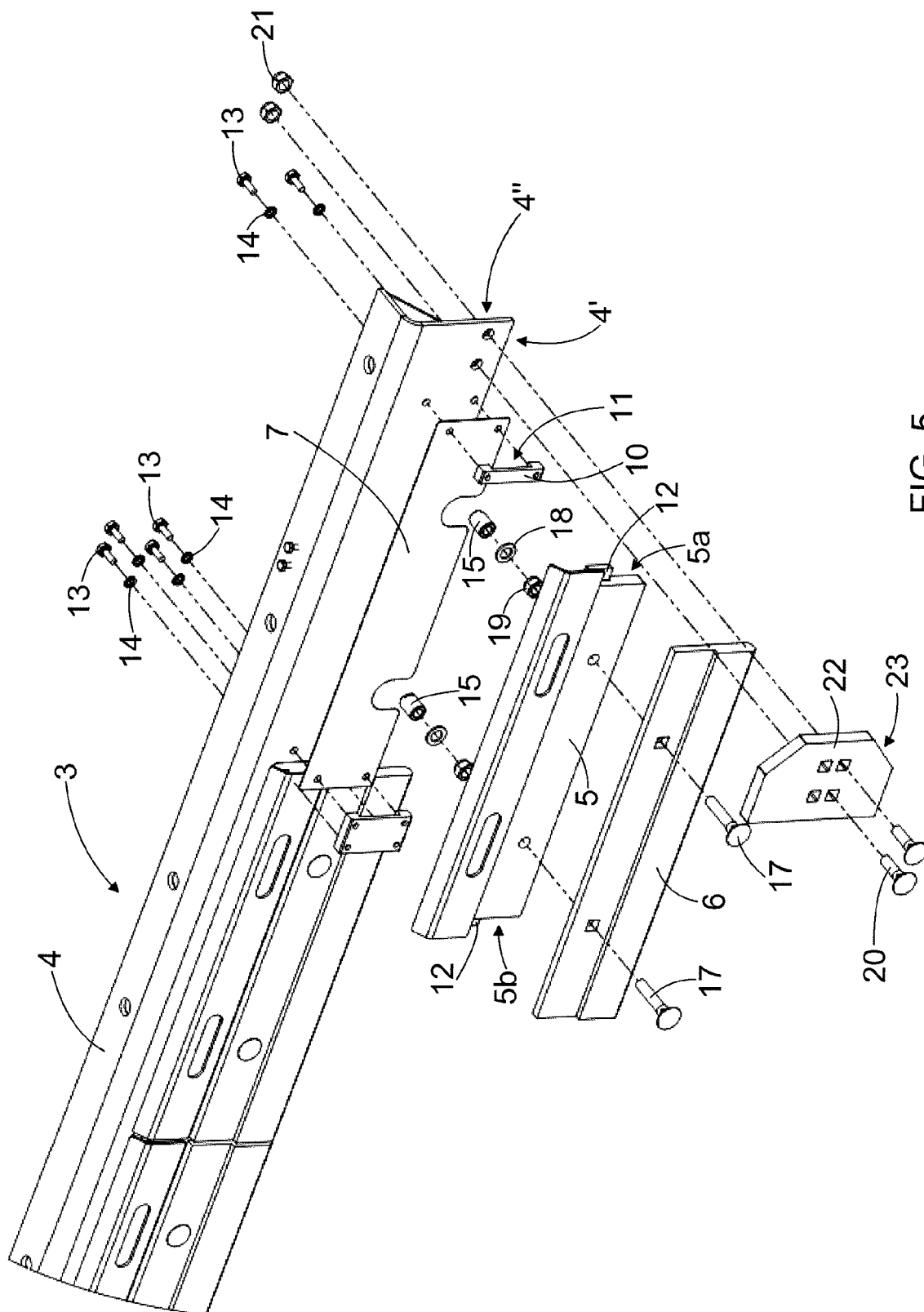


FIG. 5



EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 12 June 2015	Examiner Saretta, Guido
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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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
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