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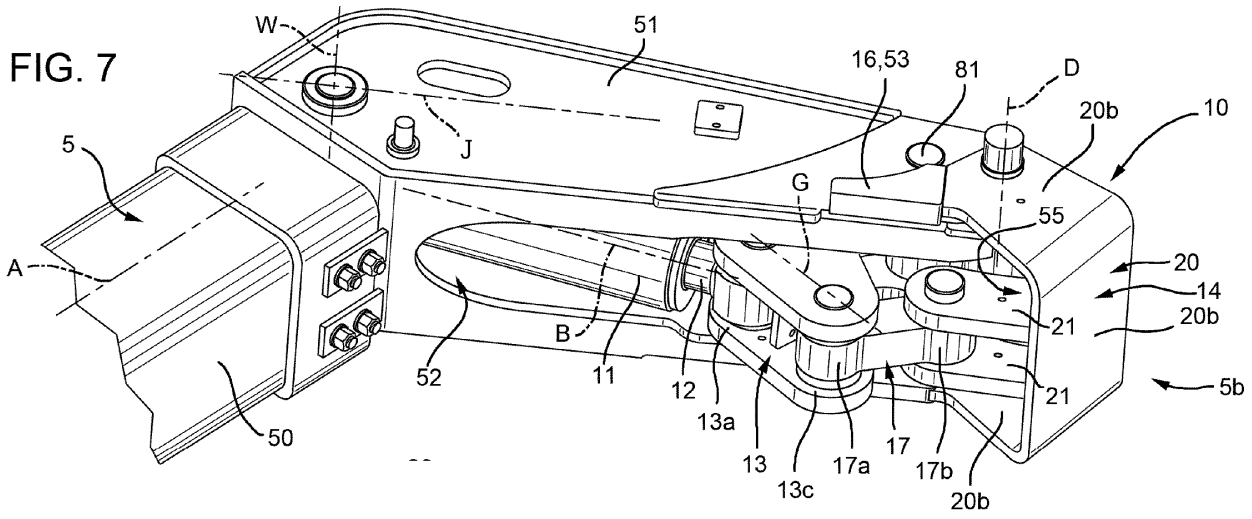
(54) HANDLING SYSTEM, BOOM FOR A TELEHANDLER AND TELEHANDLER COMPRISING SUCH BOOM

(57) Handling system for a boom (5) of a telehandler (1) comprising a cylinder (11) and a stem (12) adapted to slide within the cylinder (11) along a first direction (B); a lever (13) operatively connected to the stem (12) and adapted to rotate about a first axis (C) as a result of the sliding of the stem (12) within the cylinder (11); a locking element (14) is hinged to the boom (5) and operatively connected to the lever (13); the locking element (14) is rotatable between a first angular position, in which it is adapted to cooperate with a first stop portion of the boom (5) and to lock the stem (12) in an extended position with respect to the cylinder (11); and a second angular position different than the first angular position, in which it is adapted to cooperate with a second stop portion of the boom (5) and to lock the stem (12) in a retracted position with respect to the cylinder (11).

FIG. 7



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Description

TECHNICAL FIELD

[0001] The present invention concerns a handling system for a boom of a telehandler, and, further, to a boom for a telehandler and to a telehandler comprising such boom.

BACKGROUND OF THE INVENTION

[0002] Telehandlers (short for "telescopic handlers") are widely used both in agriculture and in industry in view of their great versatility in use.

[0003] Telehandlers generally comprise a frame, a telescopic boom articulated on the frame and traction means adapted to move the frame and the boom with respect to the ground. In detail, the boom can be fitted with various operative tools, such as a bucket, pallet forks or a winch.

[0004] Under some circumstances, such operative tools are rotatable relative to the boom about an axis transversal to the boom. Rotation of the operative tools may be obtained by means of handling system comprising a cylinder, a stem sliding within the cylinder and a leverage, which is adapted to convert the translation of the stem into a rotational movement.

[0005] In detail, the stem slides along a predetermined stroke within the cylinder between a retracted position and an extended position. However, when the stem is in the retracted or in the extended position, its position is not locked with respect to the cylinder. As a result, the stem might slip beyond the extended position and away from the cylinder, thereby causing damage to the cylinder and stem assembly.

[0006] This risk increases when the boom and the operative tool attached thereto are required to handle high loads, due to the stresses acting on the stem.

[0007] Therefore, the need is felt to obtain an optimized handling system for a boom of a telehandler, which allows minimizing the risk of damage to the mechanical parts of the boom.

[0008] An aim of the present invention is to satisfy the above mentioned needs in a cost effective and optimized manner.

SUMMARY OF THE INVENTION

[0009] The aforementioned aim is reached by a handling system, as claimed in the appended independent claims.

[0010] The aforementioned aim is also reached by a boom for a telehandler and by a telehandler comprising such boom.

[0011] Preferred embodiments of the invention are realized according to the claims dependent or related to the above independent claims.

BRIEF DESCRIPTION OF DRAWINGS

[0012] For a better understanding of the present invention, a preferred embodiment is described in the following, by way of a non-limiting example, with reference to the attached drawings wherein:

- Figure 1 is a lateral view of a telehandler according to the present invention comprising a boom and a handling system attached thereto;
- Figure 2 is a partial perspective view of the boom and the handling system of figure 1 in an enlarged scale;
- Figures 3 and 4 are lateral views of a portion of the boom and the handling system of figures 1 and 2 in a further enlarged scale in two respective operative positions;
- Figures 5 and 6 are perspective view of a component of the handling system of Figures 1 to 4; and
- Figure 7 is a partial perspective view of the boom and the handling system of Figures 1 to 4.

DETAILED DESCRIPTION OF THE INVENTION

[0013] With reference to figure 1, numeral 1 indicates a telehandler, in particular for industrial or agricultural applications.

[0014] Telehandler 1 comprises a frame 2 and a plurality of wheels 3 for moving the frame 2 with respect to the ground. In addition, telehandler 1 is preferably provided with a driver's cockpit 4.

[0015] Telehandler 1 further comprises a boom 5, which is fitted in a movable manner to frame 2. In particular, boom 5 is a telescopic boom, i.e. extendable or retractable along a direction A. Furthermore, boom 5 may be rotatable about a vertical axis Z and/or a horizontal axis Y of telehandler 1 (figure 1).

[0016] In detail, boom 5 comprises a first end 5a, at which it is articulated on frame 2 and a second end 5b, which is opposite to first end 5a and adapted to be operatively connected with a not-shown operative tool of telehandler 1, such as a bucket, pallet forks or a winch.

[0017] In the embodiment shown, boom 5 comprises a first stretch 50 on the side of first end 5a and a second stretch 51 on the side of second end 5b. In detail, second stretch 51 is hinged to first stretch 50 and is rotatable with respect to first stretch 50 about an axis W transversal to direction A. In further detail, when second stretch 51 is in the default position illustrated in figure 1, it extends along a direction J that is transversal to direction A.

[0018] As shown in figure 1, telehandler 1 comprises a handling system 10, which is arranged at second end 5b. More precisely, handling system 10 is arranged at second stretch 51.

[0019] Handling system 10 comprises, in turn, a cylinder 11, a stem 12 sliding within cylinder 11 along a direction B and a lever 13 operatively connected to stem 12. In detail, cylinder 11 may be a hydraulic or a pneu-

matic cylinder.

[0020] As shown in figure 7, second stretch 51 is at least partially hollow and defines a cavity 52. Preferably, cylinder 11 and stem 12 are completely housed inside cavity 52. In addition, lever 13 is at least partially housed inside cavity 52.

[0021] Stem 12 is slidable between an extended position and a retracted position with respect to cylinder 11. In detail, stem 12 comprises a not-shown inner end, which is arranged inside cylinder 11 and an outer end, which is opposite to the inner end and is arranged outside cylinder 11. When stem 12 is in the extended position, the outer end of stem 12 is placed at a first distance with respect to cylinder 11 (figure 3); when stem 12 is in the retracted position, the outer end of stem 12 is placed at a second distance with respect to cylinder 11 (figure 4). In detail, the second distance is smaller than the first distance.

[0022] Lever 13 is rotatable about an axis C transversal to direction B as a consequence of the movement of stem 12 within cylinder 11 (figures 3 and 4). In other words, lever 13 is adapted to convert the translation of stem 12 within cylinder 11 into a rotational movement.

[0023] Handling system 10 further comprises a locking element 14, which is hinged to boom 5 and is operatively connected to lever 13. Locking element 14 is rotatable about an axis D, which is parallel to axis C.

[0024] In particular, locking element 14 may be directly or indirectly operatively connected to lever 13. In other words, one or more elements may be interposed between lever 13 and locking element 14 without preventing lever 13 and connecting element 14 from being operatively connected to each other.

[0025] Furthermore, boom 5 comprises two stop portions 15, 16, which are adapted to limit the rotation of locking element 14 about axis D.

[0026] Advantageously, locking element 14 is rotatable between a first angular position, in which it is adapted to cooperate with stop portion 15 and to lock stem 12 in the extended position (figure 3) and a second angular position, in which it is adapted to cooperate with stop portion 16 and to lock stem 12 in the retracted position (figure 4).

[0027] Since locking element 14 is operatively connected to lever 13 and since lever 13 is adapted to rotate as a consequence of the movement of stem 12 within cylinder 11, the rotation of locking element 14 is determined by the movement of stem 12 within cylinder 11. In particular, each position of stem 12 within cylinder 11 between the extended and the retracted positions corresponds to an angular position of locking element 14 between the first and the second angular positions.

[0028] In detail, locking element 14 is adapted to contact stop portion 15 in the first angular position and to contact stop portion 16 in the second angular position. In further detail, stop portion 15 is adapted to prevent the rotation of locking element 14 beyond the first angular position in the rotational direction oriented from the second angular position to the first angular position. Similarly, stop portion 16 is adapted to prevent the rotation of locking element 14 beyond the second angular position in the rotational direction oriented from the first angular position to the second angular position.

[0029] Preferably, locking element 14 is rotatable between the first angular position and the second angular position by an angle of 135° about axis D.

[0030] As shown in figures 3 and 4, handling system 10 further comprises a connecting element 17, which is operatively connected to lever 13 and to locking element 14. In particular, connecting element 17 is adapted to transmit to locking element 14 the rotation of lever 13 about axis C.

[0031] Furthermore, as shown in figures 3 and 4, lever 13 comprises a central portion 13a, a first arm 13b and a second arm 13c. In detail, first and second arms 13b, 13c extend from central portion 13a along two respective directions F, G transversal to each other. In other words, lever 13 is substantially V-shaped or boomerang-shaped.

[0032] More precisely, central portion 13a, first and second arms 13a, 13b form a single piece. In addition, first arm 13a and second arm 13b are rounded to each other.

[0033] Lever 13 is hinged to the outer end of stem 12 at central portion 13a; it is hinged to boom 5 at first arm 13b with a hinge 80 and it is hinged to connecting element 17 at second arm 13c.

[0034] In detail, hinge 80 is a fixed hinge and comprises a pin 81 defining axis C. In further detail, pin 81 protrudes from second stretch 51 and out of cavity 52 parallel to axis C (figure 2) .

[0035] As shown in figures 3 and 4, the extension of first arm 13b along direction F is greater than the extension of second arm 13c along direction G. In addition, the distance between the point at which central portion 13a is hinged to stem 12 and hinge 80 is greater than the distance between the point at which central portion 13a is hinged to stem 12 and the point at which second arm 13c is hinged to connecting element 17.

[0036] In the embodiment shown, proceeding along first arm 13b along direction F and away from central portion 13c, the extension of first arm 13b perpendicularly to direction F progressively decreases and then progressively increases. On the other hand, proceeding along second arm 13c along direction G and away from central portion 13a, the extension of second arm 13c perpendicularly to direction G progressively decreases.

[0037] As shown in detail in figures 5 and 6, locking element 14 comprises a main portion 20 and two flange portions 21.

[0038] In detail, main portion 20 comprises a central portion 20a and two lateral portions 20b, which extend from central portion 20a at two respective opposite ends thereof along a direction E of locking element 14. In further detail, central portions 20a and lateral portions 20b are planar and rounded to one another. In addition, lateral

portions 20b are perpendicular to central portion 20a. In other words, main portion 20 is U-shaped.

[0039] In particular, when locking element 14 is fitted to boom 5, direction E and axis D are parallel to each other.

[0040] Each lateral portion 20b comprises, in turn, an abutment portion 24, which is adapted to abut against second stop portion 16 when locking element 14 is in the second angular position (figures 4 and 7). In detail, each abutment portion 24 is planar and is arranged at the end of the respective lateral portion 20b opposite to central portion 20a.

[0041] Flange portions 21 extend from central portion 20a on the same side of lateral portions 20b and are interposed between lateral portions 20b along direction E. In addition, flange portions 21 are spaced from each other along direction E and are identical to each other. Preferably, flange portions 21 are arranged symmetrically with respect to a median plane of main portion 20 along direction E.

[0042] As shown in figures 3 and 4, main portion 20 is hinged to boom 5 and flange portions 21 are hinged to connecting element 17.

[0043] In detail, main portion 20 is formed with two holes 22 through which locking element 14 is hinged to boom 5. In further detail, each lateral portion 20b is formed with a respective hole 22. As illustrated in figures 5 and 6, holes 22 are through and concentric holes.

[0044] In addition, each flange portion 21 is formed with a respective hole 23, through which locking element 14 is hinged to connecting element 17. As illustrated in figures 5 and 6, holes 23 are through and concentric holes.

[0045] Furthermore, as shown in figures 3 and 4, connecting element 17 is substantially a rod comprising a first end 17a and a second end 17b, which are opposite to each other. In detail, first end 17a is hinged to second arm 13c of lever 13 and second end 17b is hinged to flange portions 21 through holes 23.

[0046] As illustrated in figure 7, locking element 14 is fitted to boom 5 in such a manner that main portion 20 and flange portions 21 face boom 5 and define a seat 55 with respect to second end 5b. More precisely, central portion 20a faces boom 5 on the side from which lateral portions 20b and flange portions 21 extend. In addition, main portion 20 is arranged completely external with respect to cavity 52.

[0047] More precisely, seat 55 is delimited by central portion 20a on the side from which lateral portions 20b and flange portions 21 extend. Seat 55 is further delimited by lateral portions 20b on the side of flange portions 21 and second end 5b of boom 5.

[0048] Furthermore, stop portions 15 and 16 can be variously conformed for the purpose of limiting the rotation of locking element 14 between the first and the second angular positions.

[0049] In the embodiment shown, stop portion 15 comprises hinge 80, which acts as a detent. In detail, the portion of hinge 80 arranged externally with respect to cavity 52 is adapted to act as an abutment for locking element 14, when locking element 14 is in the first angular position (figure 3). In further detail, such portion of hinge 80 is adapted to abut against lateral portions 20b of locking element 14.

[0050] Alternatively or in addition, stop portion 15 comprises a portion of end 5b of boom 5. In detail, when locking element 14 is in the first angular position, locking element 14 abuts against end 5b. In further detail, flange portions 21 are adapted to contact end 5b, when locking element 14 is in the first angular position (figure 3).

[0051] Stop portion 16 comprises a detent 53 arranged at second stretch 51 and extending transversally to direction J towards the outside of second stretch 51. Detent 53 is completely external with respect to cavity 52 and comprises an abutment portion 54 (figure 3). In detail, abutment portion 54 is adapted to contact abutment portion 24 of locking element 14 when locking element 14 is in the second angular position (figures 4 and 7) .

[0052] The operation of the locking element 14 according to the invention and described as above is the following. In particular, the operation will be described starting from a condition in which locking element 14 is in the first angular position (figure 3).

[0053] In this condition, stem 12 is in the extended position and locking element 14 abuts against first stop portion 15. In particular, lateral portions 20b abut against hinge 80 and/or flange portions 21 abut against a portion of end 5b.

[0054] Therefore, the rotation of locking element 14 beyond the first angular position in the rotational direction oriented from the second angular position to the first angular position is prevented.

[0055] When it is necessary to operate the operative tools fitted to boom 5, stem 12 moves from the extended position toward the retracted position and the outer end of stem 12 moves closer to cylinder 11 along direction B. Accordingly, lever 13, which is hinged to stem 12 rotates about axis C. In detail, with reference to figure 3, lever 13 rotates clockwise about axis C.

[0056] As a consequence of the rotation of lever 13 and because of the fact that locking element 14 is operatively connected to lever 13 through connecting element 17, locking element 14 rotates about axis D toward the second angular position.

[0057] When stem 12 reaches the retracted position, locking element 14 is in the second angular position. In this condition, locking element 14 abuts against second stop portion 16. In detail, abutment portion 24 of locking element 14 abuts against abutment portion 54 of detent 53 (figures 4 and 7).

[0058] Therefore, the rotation of locking element 14 beyond the second angular position in the rotational direction oriented from the first angular position to the second angular position is prevented.

[0059] In view of the foregoing, the advantages of handling system 10, of boom 5 and telehandler 1 according to the invention are apparent.

[0060] In particular, handling system 10 comprises locking element 14, which is rotatable between the first angular position, in which it is adapted to lock stem 12 in the extended position and the second angular position, in which it is adapted to lock stem 12 in the retracted position.

[0061] Accordingly, the risk of damage to the mechanical parts of boom 5 is minimized. In fact, since the rotation of locking element 14 beyond the first angular position in the rotational direction from the second angular position to the first angular position is prevented, stem 12 cannot slip beyond the extended position and away from cylinder 11. The risk of damages is reduced also when boom 5 and the operative tools attached thereto are subjected to high loads.

[0062] It is clear that modifications can be made to the described handling system 10 which do not extend beyond the scope of protection defined by the claims.

[0063] For the sake of example, handling system 10 could comprise more than one lever 13 and/or more than one connecting element 17. In addition, lever 13, connecting element 17 and locking element 14 could be differently shaped.

Claims

1. Handling system for a boom (5) of a telehandler (1) comprising:

   - a cylinder (11) and a stem (12) adapted to slide within said cylinder (11) along a first direction (B);
   - a lever (13) operatively connected to said stem (12) and adapted to rotate about a first axis (C) as a result of the sliding of said stem (12) within said cylinder (11); said first axis (C) being transversal to said first direction (B); and
   - a locking element (14), which is hinged to said boom (5) and is operatively connected to said lever (13); said locking element (14) being rotatable about a second axis (D) parallel to said first axis (C);

   wherein said locking element (14) is rotatable between:

   - a first angular position, in which it is adapted to cooperate with a first stop portion (15) of said boom (5) and to lock said stem (12) in an extended position with respect to said cylinder (11); and
   - a second angular position different than the first angular position, in which it is adapted to cooperate with a second stop portion (16) of said boom (5) and to lock said stem (12) in a retracted position with respect to said cylinder (11) .

2. Handling system according to claim 1, further comprising a connecting element (17), which is operatively connected to said lever (13) and said locking element (14); said connecting element (17) being adapted to transmit to said locking element (14) the rotation of said lever (13) about said first axis (C).

3. Handling system according to claim 2, wherein said lever (13) is hinged to said stem (12), to said boom (5) and to said connecting element (17).

4. Handling system according to claims 2 or 3, wherein said locking element (14) comprises:

   - a main portion (20) through which it is adapted to be hinged to said boom (5); and
   - at least one flange portion (21) extending from said main portion (20) and through which it is hinged to said connecting element (17).

5. Handling system according to claim 4, wherein said locking element (14) is adapted to be fitted to said boom (5) in such a manner that said main portion (20) and said at least one flange portion (21) are adapted to face said boom (5) and to define a seat (55) with respect to said boom (5).

6. Handling system according to any one of the foregoing claims, wherein said locking element (14) is rotatable between said first angular position and said second angular position by an angle of 135° about second axis (D).

7. Boom for a telehandler (1) comprising:

   - a first end (5a) at which said boom (5) is adapted to be articulated on said telehandler (1);
   - a second end (5b), which is opposite to said first end (5a) and adapted to be operatively connected with an operative tool of said telehandler (1); and
   - a handling system (10) according to any one of the foregoing claims; said handling system (10) being arranged at said second end (5b).

8. Boom according to claim 7, further comprising:

   - a first stop portion (15), against which a locking element (14) of said handling system (10) is adapted to abut when said locking element (14) is in a first angular position; and
   - a second stop portion (16), against which said locking element (14) is adapted to abut when said locking element (14) is in a second angular position that is different than the first angular position.

9. Boom according to claim 8, wherein said first stop

portion (15) and/or said second stop portion (16) is a detent (53; 80) or a portion of said second end (5b).

10. Telehandler comprising:

- a frame (2);
- traction means (3) adapted to move said frame (2) with respect to the ground; and
- a boom (5) according to any one of claims 7 to 9.

FIG. 2

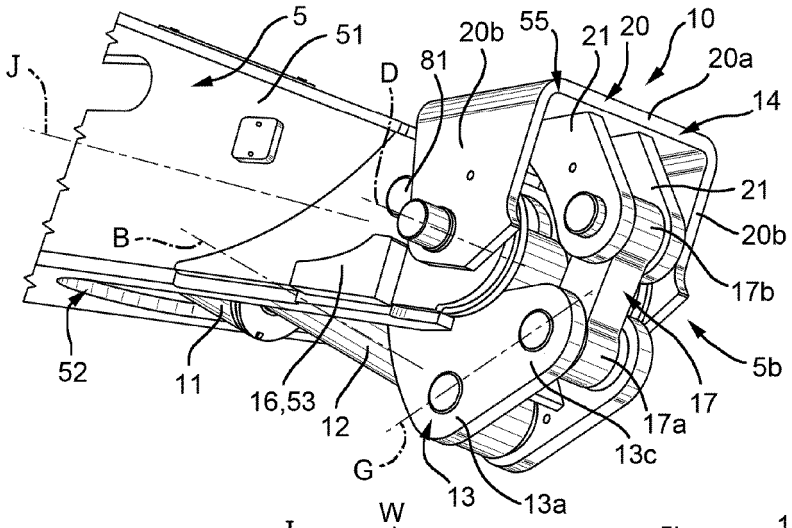
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FIG. 1

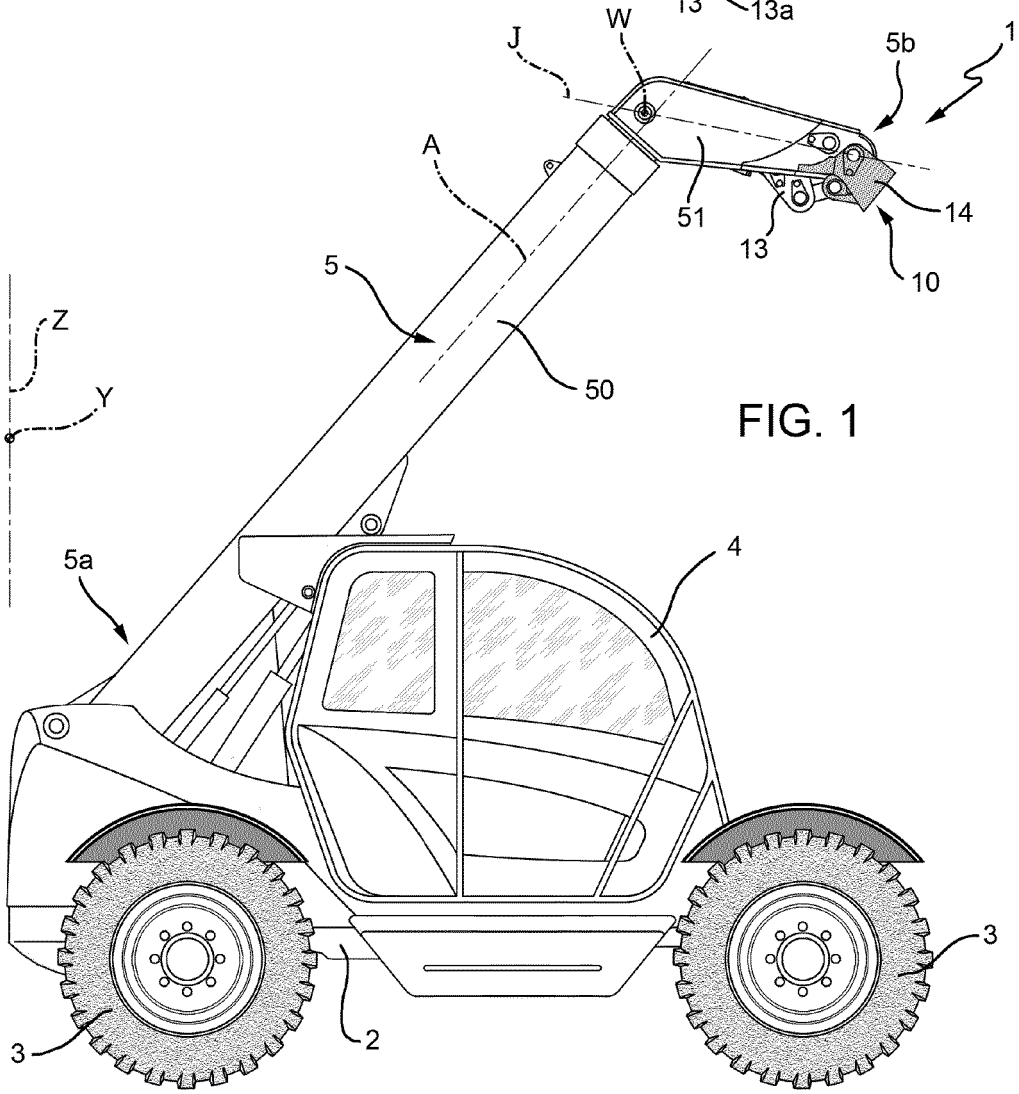
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FIG. 4

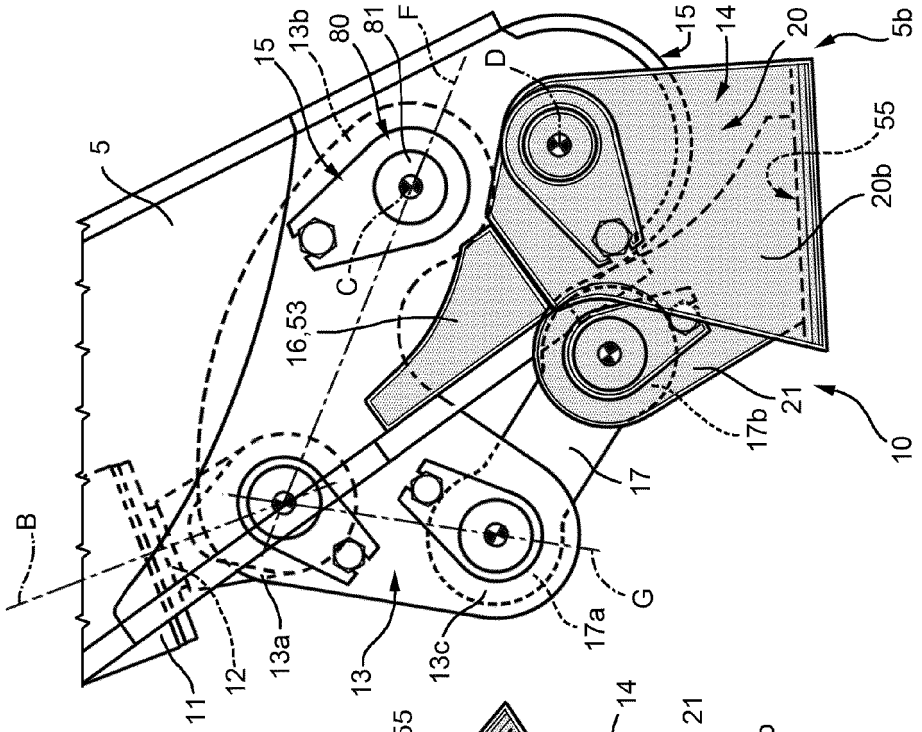
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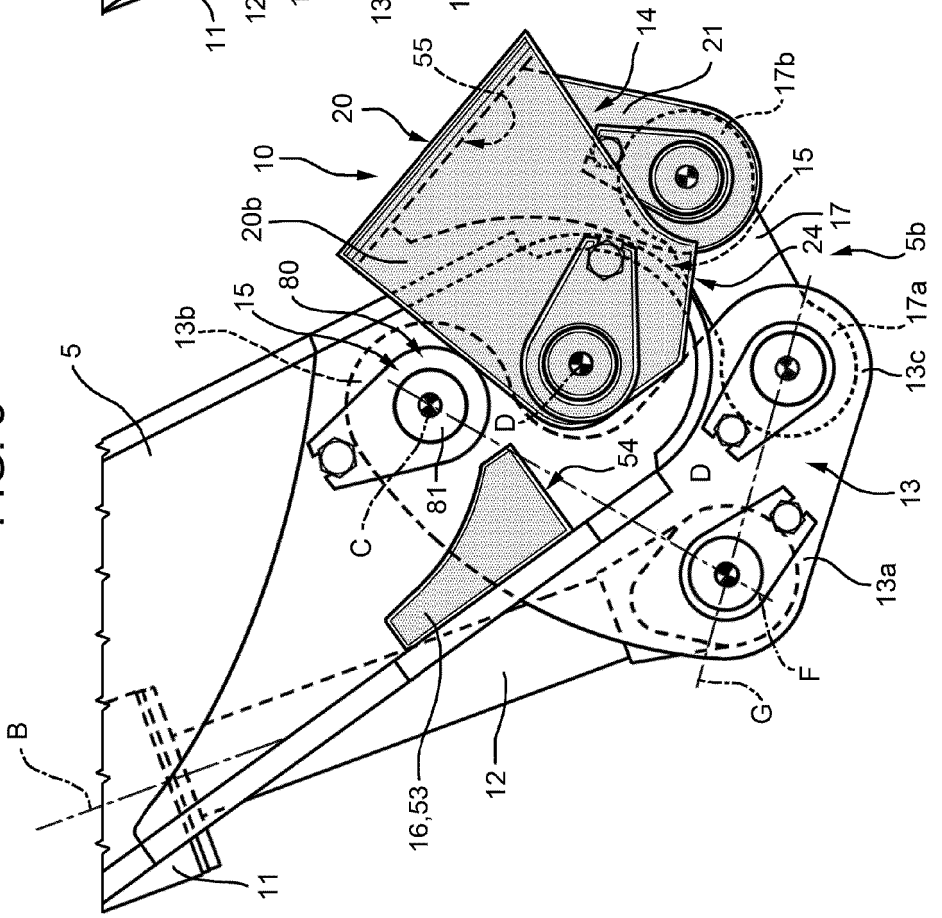
FIG. 3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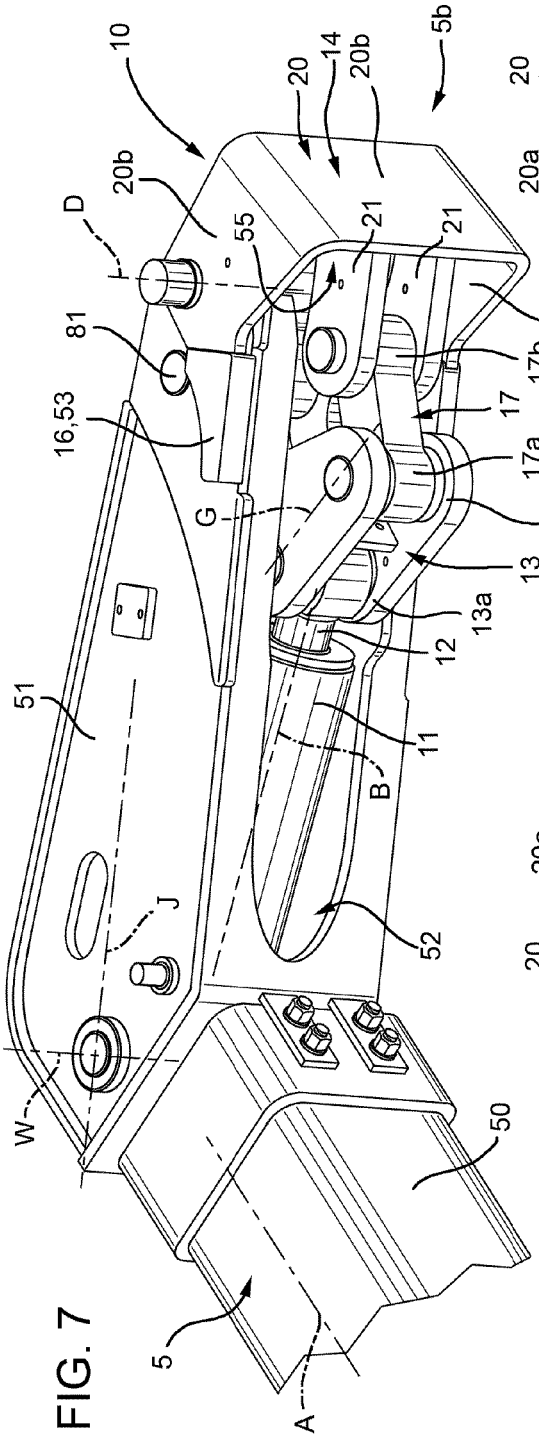

FIG. 7

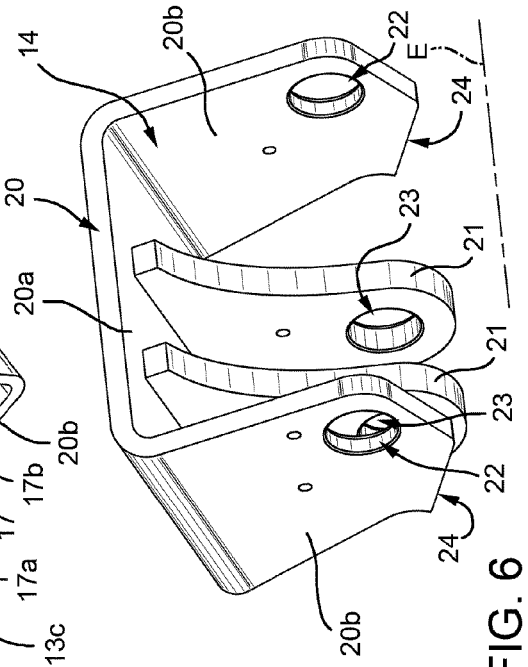

FIG. 6

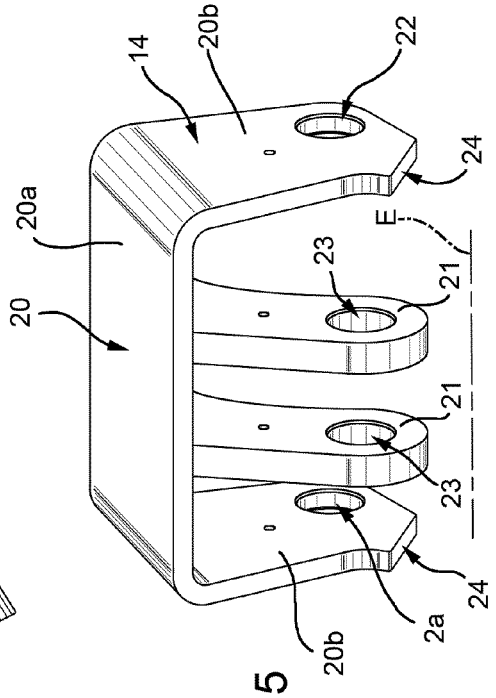

FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 22 16 3225

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	* abstract; figures 1,7a-7d * * column 12, lines 58-65 *	10	B66F9/065 E02F3/96 E02F9/14
X	US 9 719 231 B2 (CATERPILLAR INC [US]) 1 August 2017 (2017-08-01)	1,6-9	
Y	* column 2, lines 47-52 *	10	
A	* abstract; figures 1-6 *	2-5	
X	US 2008/295679 A1 (CALLAGHAN MERRITT P [GB] ET AL) 4 December 2008 (2008-12-04) * abstract; figure 1 *	1	
Y	US 2006/180563 A1 (KNIGHT DAVID J [GB]) 17 August 2006 (2006-08-17)	10	
A	* abstract; figures 1-3 *	1-9	

TECHNICAL FIELDS SEARCHED (IPC)

E02F
B66F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 July 2022	Ferrien, Yann

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 22 16 3225

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21-07-2022

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