(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 523 873 A1**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
19.03.2025 Bulletin 2025/12

(21) Application number: **24200078.4**

(22) Date of filing: **12.09.2024**

(51) International Patent Classification (IPC):
B27L 7/00 *(2006.01)* ***B27L 7/06*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B27L 7/00; B27L 7/06

(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 ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
GE KH MA MD TN

(30) Priority: **13.09.2023 IT 202300018825**

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(54) VERTICAL WOOD SPLITTER

(57) Vertical log splitter comprising a vertical pillar (10) and a cutting wedge (12), which is mounted translatable along the longitudinal axis of said vertical pillar (10), in such a way that the displacement of said cutting wedge (12) allows a trunk positioned at the vertical pillar (10) to be subdivided into two or more parts.

Means for retaining the trunk in place and means for activating the displacement of said cutting wedge (12) are also provided.

The retaining means consist of two articulated arms (2), mounted on the sides of said vertical pillar (10) .

Each articulated arm (2) comprises at least one element of contact and coupling with the trunk (20), which contact and coupling element (20) is connected to a lever through a first joint (25), said lever being connected to the vertical pillar (10) through a second joint (23), the first joint (25) being configured at least to allow a rotation of the contact and coupling element (20) around the axis of the lever, the second joint (23) being configured to allow the displacement of the coupling and contact element (20) according to at least one degree of freedom.

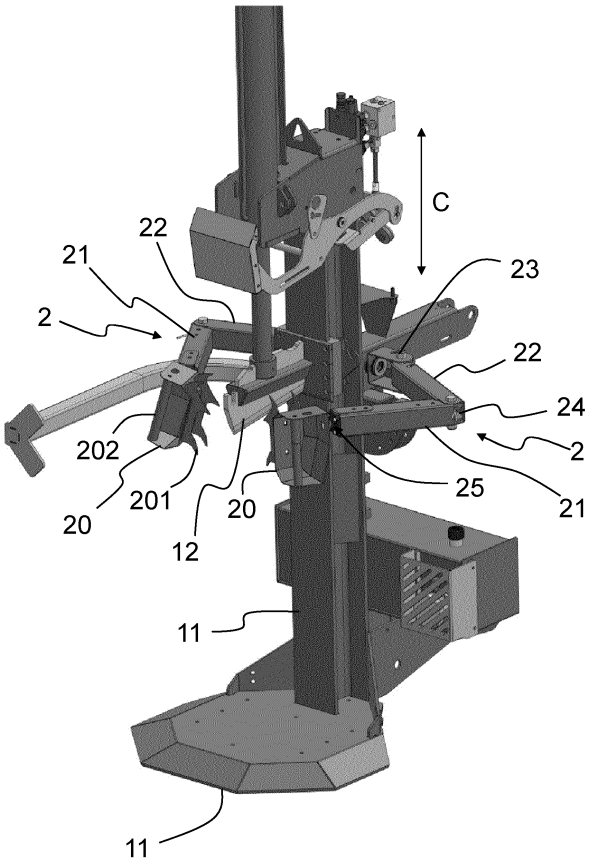

Fig. 2a

EP 4 523 873 A1

Description

[0001] The present invention relates to a vertical log splitter comprising a vertical pillar and a cutting wedge.

[0002] The cutting wedge is mounted translatable along the longitudinal axis of the vertical pillar, in such a way that the displacement of the cutting wedge allows a trunk positioned at the vertical pillar to be subdivided into two or more parts.

[0003] Means for retaining the trunk in place and means for activating the displacement of said cutting wedge are also provided.

[0004] The one just described is the common configuration of the vertical log splitters known to the state of the art, which provide for a cutting wedge which is handled by a hydraulic cylinder, so that the cutting wedge can exert a pressure on the trunk such that the wedge penetrates inside the trunk so as to subdivide the trunk, generally, into two parts.

[0005] The trunk is usually positioned with its longitudinal axis parallel to the longitudinal axis of the vertical pillar and the wedge consists of a straight blade that divides the trunk into two parts.

[0006] The trunk can then be rotated around its longitudinal axis so that the process is repeated and the trunk is subdivided into two further sub-parts.

[0007] The retaining means generally comprise a hook that blocks the trunk in place and means for handling the trunk along a place for supporting the trunk itself, which may also consist of the ground on which the vertical log splitter rests.

[0008] All systems installed on the vertical log splitting machines on the market envisage using retaining means with two levers, or handles, which allow the operator to block the trunk, in a very approximate and difficult way, by keeping both hands busy on said handles, and allowing them to start log splitting safely at the same time.

[0009] Currently, there are several embodiments of the trunk retaining means, which differ mainly in the different degrees of freedom and ergonomics they offer to the operator.

[0010] According to a first type, the start of the splitting stroke of the cutting wedge is controlled by two handles placed at the top of the log splitter.

[0011] In this way, the operator is obliged to have both hands on the handles during the splitting process, avoiding risks of cutting, crushing or shearing of the hands or upper limbs.

[0012] The positioning and containment of the trunk during the whole splitting process is entrusted to a second independent device, in this case the log is held in place and almost stable by a small hook placed under the cutting wedge.

[0013] This type of log splitter does not allow the piece of wood to be handled, either before, during or after the splitting step, with the consequent danger of the split log falling towards the operator.

[0014] According to a further type of embodiment, the retaining means have a fixed lever provided at the top of the log splitter and a lever that is movable according to two degrees of freedom, preferably horizontal and vertical.

[0015] In this way, the operator is obliged to have both hands on the levers during the splitting process, avoiding risks of cutting, crushing or shearing of the hands or upper limbs.

[0016] There is the possibility of blocking and holding the trunk for the entire duration of the splitting process by acting on the movable lever which, by means of a hook or other similar component, after having it rest on the log, allows small horizontal displacements but always perpendicular to the cutting wedge.

[0017] With this system it is possible to handle the piece of wood, only perpendicularly to the wedge before the splitting step, during the splitting step only a lateral part of the split log can be accompanied and also at the end of the step, the lateral piece will be guided by the movable lever, but the other piece will not be controlled with risks for the operator.

[0018] The last type of embodiment of the retaining means provides two openable levers, that is, which can be handled along a horizontal place.

[0019] The start of the splitting stroke of the wedge is controlled by the two levers, placed in a predetermined position, based on the current regulations and operational needs.

[0020] For example, the two levers can be positioned approximately halfway up with respect to the length of the vertical pillar, i.e. the area used to receive the log to be split.

[0021] Both levers can be opened by rotating laterally to accommodate logs of different sizes, thanks to a degree of freedom of movement.

[0022] In this way, the operator is obliged to have both hands on these levers during the splitting process, avoiding risks of cutting, crushing or shearing of the hands or upper limbs.

[0023] These retaining means give the possibility of blocking and holding the trunk for the entire duration of the splitting process, by acting on both levers which, by means of toothings or another similar component, after catching the log, allow small horizontal displacements but always perpendicular to the cutting wedge.

[0024] With this system it is possible to handle the piece, only perpendicularly to the wedge before the splitting step, during the splitting step it will be possible to contain the split log and even at the end of the step the log will remain blocked between the two levers, avoiding risks for the operator.

[0025] The vertical log splitters known to the state of the art have retaining means that do not allow the operator to block and above all handle the trunk easily both transversely and parallel to the cutting wedge, with the consequence of having a reduced handling of the piece, before, while splitting and practically no handling after the splitting step.

[0026] In fact, all the levers described have only one or at most two degrees of freedom, since they are constrained on one or two axes.

[0027] This leads to an uncomfortable use, not very ergonomic, difficult to adapt to the varying sizes of the wood log to be cut, both in length and diameter.

[0028] Moreover, the operator often fails to block the trunk as he would like to, also leading him to use his hands and feet to displace or hold the trunk during the splitting process, which turns out to be a particularly risky operation.

[0029] There is therefore an unmet need for the systems known to the state of the art to solve the disadvantages set out above, in particular to block and, above all, to handle the trunk easily both transversely and parallel to the cutting wedge, in order to obtain a wide handling of the piece, before, after and during splitting.

[0030] The present invention achieves the above objects by realizing a vertical log splitter as described above, wherein the retaining means consist of two articulated arms, mounted on the sides of the vertical pillar.

[0031] Each articulated arm comprises at least one element of contact and coupling with the trunk, which is connected to a lever through a first joint.

[0032] The lever is connected to the vertical pillar through a second joint.

[0033] Furthermore, the first joint is configured at least to allow a rotation of the contact and coupling element around the axis of the lever, while the second joint is configured to allow the displacement of the coupling and contact element at least according to a degree of freedom.

[0034] Based on this configuration, a vertical log splitter is obtained with different degrees of freedom, given by the first and second joint.

[0035] The piece of trunk can therefore be handled in different directions, thanks to the first joint, with respect to the cutting wedge and according to different heights, thanks to the first joint.

[0036] The means for retaining the log splitter subject-matter of the present invention allow to improve the method for containing and handling the trunks, before and during the splitting step and at the same time it integrates the two-hand control necessary for the safe operation of the log splitter.

[0037] As will be evident from the following description, unlike the systems known to the state of the art that present minimal freedom of retention of the trunks, in particular only lateral or upper retention, the system subject-matter of the present invention gives different degrees of freedom, guaranteeing to the user the possibility of operating on the trunk according to different configurations and according to different degrees of freedom, giving the system subject-matter of the present invention a high adaptability, both on the basis of the sizes of the trunks, and on the basis of operational needs.

[0038] Starting from this generic configuration, it is possible to envisage several and numerous variants of the log splitter subject-matter of the present invention, which further increase the degrees of freedom of the articulated arms belonging to the log splitter subject-matter of the present invention.

[0039] According to a preferred embodiment, the lever consists of a first lever arm connected with a first end to the contact and coupling element and with a second end to a second lever arm through a third joint.

[0040] The second lever arm is then connected to the vertical pillar through the second joint.

[0041] According to an improvement, the third joint is configured to allow relative handling between the first and second lever arm at least according to a degree of freedom.

[0042] Thanks to this variant, the articulated arms can have many more movements in each direction, in order to simulate a human arm.

[0043] The articulated arms made in this way allow to obtain a lot of freedom of movement in space, since they are able to displace the contact and coupling elements in a large volume in space.

[0044] In particular, as will be evident from the illustration of some embodiment examples, the third joint allows the vertical movement of the lever arms and of the coupling and contact element and the advancement/retraction of the arm towards the operator.

[0045] The second joint allows the opening and closing of the first lever arm, it thus allows the possibility of blocking and handling trunks of different sizes and heights.

[0046] The first joint is a ball joint, which allows the contact and coupling elements to be rotated in all directions.

[0047] The result is that each articulated arm has five degrees of freedom and allows the operator to ergonomically block any log to be split.

[0048] The articulated arms can also be adapted to the operator, for example based on the height.

[0049] As anticipated, the first joint preferably consists of a spherical joint.

[0050] Furthermore, advantageously, the second joint allows the handling of the lever according to two degrees of freedom, respectively according to a rotation around its longitudinal axis and a translation of the contact and coupling element on a horizontal plane.

[0051] Based on what has been described, it is evident that the means for retaining the vertical log splitter subject-matter of the present invention allows to control, handle and displace the log exactly as the operator wishes before, during and after the splitting step.

[0052] The vertical log splitter subject-matter of the present invention, therefore, adapts completely to the trunk to be cut, both to the operational needs and to the physical and ergonomic characteristics of the operator.

[0053] According to a preferred embodiment variant, the contact and coupling element comprises a gripping element configured to allow gripping by an operator.

[0054] This feature facilitates the operator's man-

oeuvrability of the articulated arms, as the controls no longer have a fixed position but follow the operator's hand.

[0055] According to an implementation variant of the feature just described, the means for activating the displacement of the cutting wedge are placed at the gripping element.

[0056] Therefore, the operator, by grasping the two contact and coupling elements, will have the possibility of blocking the trunk indirectly, through the clamping force exerted by the contact and coupling elements, without having to act directly with hands or other parts of the body, to arrange the log as best desired and control the splitting step, all in safety as it is moreover provided for by the regulations currently in force.

[0057] In view of the advantages described above, the present invention also relates to a trunk containment and handling system for vertical log splitters, which vertical log splitters comprise a vertical pillar and a cutting wedge, which is mounted translatable along the longitudinal axis of the vertical pillar, in such a way that the displacement of the cutting wedge allows a trunk positioned at the vertical pillar to be subdivided into two or more parts.

[0058] The system subject-matter of the present invention comprises means for retaining the trunks in place and means for fixing the retaining means to the vertical pillar.

[0059] In particular, the retaining means are made according to one or more of the characteristics described above, taken alternatively or in combination with each other.

[0060] The fixing means preferably consist of removable fixing means.

[0061] Two articulated arms are therefore made that can be adapted and fixed to the vertical log splitters known to the state of the art.

[0062] In particular, the articulated arms can be fixed according to any of the ways known to the state of the art and are fixed to the vertical pillar of the log splitters known to the state of the art.

[0063] It follows that the log splitter known to the state of the art can be modified, through the system subject-matter of the present invention, in order to obtain a vertical log splitter having all the advantages described above for the vertical log splitter subject-matter of the present invention.

[0064] These and other features and advantages of the present invention will become clearer from the following disclosure of some exemplary embodiments illustrated in the accompanying drawings in which:

figures 1a to 1c illustrate three views of three different types of the vertical log splitters known to the state of the art;

figure 2a illustrates a perspective view of a possible embodiment of the vertical log splitter subject-matter of the present invention;

figure 2b illustrates a detail of the embodiment variant of Figure 2a.

[0065] It is specified that the figures appended to the present patent application illustrate some embodiments of the vertical log splitter subject-matter of the present invention, to better understand the advantages and features described therein.

[0066] These embodiments are therefore to be understood as purely illustrative and not limiting to the inventive concept of the present invention, namely that of making a vertical log splitter with retaining means that allow blocking and above all handling the trunk easily both transversely and parallel to the cutting wedge, with the consequence of having a wide handling of the piece before, during and after splitting.

[0067] With particular reference to figures 1a to 1c, some possible embodiments of vertical log splitters known to the state of the art are illustrated.

[0068] All the vertical log splitters 1 known to the state of the art, a vertical pillar 10 and a cutting wedge 12, which is mounted translatable along the longitudinal axis of the vertical pillar 10, in such a way that the displacement of the cutting wedge 12 allows a trunk positioned at the vertical pillar 10 to be subdivided into two or more parts.

[0069] Preferably, the stroke of the cutting wedge 12 is regulated by a motor, electric or combustion one, which drives a piston 13, the actuation of which allows to handle the cutting wedge 12 in the vertical direction indicated by the arrow C.

[0070] It is specified that, both with reference to the figures and to the entire text of this patent application, the term vertical means an axis facing parallel or coinciding with the longitudinal axis of the vertical pillar 10.

[0071] Consequently, the terminology "horizontal plane" means a plane perpendicular to the vertical axis.

[0072] The trunk is positioned at the vertical pillar 10, resting on the support base 11 of the vertical pillar 10: during its stroke, the cutting wedge 12 meets the trunk and the power delivered by the motor allows pushing the cutting wedge 12 so that it penetrates inside the trunk and subdivides it.

[0073] Based on the shape of the cutting wedge 12, the trunk will be subdivided into two, three or more parts.

[0074] In the vertical log splitters illustrated in the figures, the shape of the cutting wedge 12 provides for subdividing the trunk into two parts, which parts can be repositioned again at the vertical pillar 10 to be subdivided into further parts.

[0075] To prevent the trunk or parts thereof from falling sideways, the log splitters known to the state of the art have means for retaining the trunk in place, which, generally, integrate means for activating the displacement of the cutting wedge 12, that is, for activating the motor.

[0076] The three variants known to the state of the art differ in the realization of the retaining means, as described above.

[0077] According to the variant illustrated in figure 1a, the retaining means comprise two levers A, which activate the stroke of the cutting wedge 12 and containment members 14, fixed to the vertical pillar 10, which prevent

the lateral fall of the cut trunk.

[0078] The vertical log splitter of the variant of figure 1b, on the other hand, provides two handles B for activating the motor, or rather the hydraulic cylinder, and a lever 100, displaceable along a horizontal plane, which has a hook 15 designed to engage with the trunk to be subdivided.

[0079] Finally, figure 1c illustrates a further embodiment of the retaining means, always known to the state of the art, which has two levers 101, fixed with one end thereof to the vertical pillar 10, so that they can oscillate along a horizontal plane, to move closer to/away from each other so as to adjust their distance with respect to the sizes of the trunk.

[0080] The levers 101 integrate the means for activating the stroke of the cutting wedge 12.

[0081] In addition, the levers 101 have hooks 110 designed to engage with the trunk to be subdivided.

[0082] As is evident from the log splitter known to the state of the art, it is started from a common structural form, the pillar 10, the cutting wedge 12 and the means for handling (motor) the cutting wedge 12.

[0083] The retaining means are fixed in the different variants to this common structural form, in particular to the vertical pillar 10.

[0084] For this reason, this patent application also has as its object, in addition to a vertical log splitter, also retaining means to be fixed to the vertical log splitters known to the state of the art.

[0085] An embodiment variant of such retaining means is illustrated in figures 2a and 2b.

[0086] With reference to the figures, the retaining means consist of two articulated arms 2, positioned on the sides of the vertical pillar 10.

[0087] These articulated arms 2 can preferably be made identical to each other, i.e. they have the same components and can be fixed to each other in the same way.

[0088] In particular, each articulated arm 2 comprises an element of contact and coupling 20 with the trunk, connected to a first lever arm 21 through a first joint 25.

[0089] The first lever arm 21 is connected with a first end to the contact and coupling element 20 and with a second end to a second lever arm 22 through a third joint 24.

[0090] The second lever arm 22 is connected to the vertical pillar 10 through a second joint 23.

[0091] As will be apparent from the following description, each articulated arm 2 is configured to be handled like a human arm, wherein the contact element 20 corresponds to the hand 20, the first lever arm 21 corresponds to the forearm, while the second lever arm 22 corresponds to the arm.

[0092] Similarly, the first joint 25 corresponds to the wrist joint, the second joint 23 corresponds to the shoulder joint, while the third joint 24 corresponds to the elbow joint.

[0093] In fact, the first joint 25 consists of a spherical joint, in such a way that the contact and coupling element 20 can not only rotate around the longitudinal axis of the first lever arm 21, i.e. the axis D, but it can also oscillate in space, moving closer to/away from the first lever arm 21, exactly as a hand moves with respect to the forearm.

[0094] As for the hand, it is possible to envisage that the coupling and contact element 20 has a limited rotation, that is, with a limited stroke, with respect to the axis D.

[0095] The first lever arm 21 is pivoted to the second lever arm, so that the joint 24 gives a degree of freedom of movement, i.e. an oscillation of the end of the first lever arm 21 connected to the contact and coupling element 20, along a horizontal plane, around the axis E.

[0096] As anticipated, the end of the second lever arm 22 not connected to the first lever arm 21 is connected to the vertical pillar through the second joint 23.

[0097] The second joint 23 gives the second lever arm 22 two degrees of freedom, namely a rotation of the second lever arm 22 around the axis G and an oscillation of the end connected to the first lever arm 21 along a horizontal plane, namely an oscillation around the axis F.

[0098] From what has just been described, an operator who grasps the coupling and contact elements 20 can handle the articulated arms 2 in the space by displacing the contact and coupling elements 20 in all the useful positions in order to be able to hold in place a trunk that must be subdivided by the cutting wedge 12, by retaining the parts of the trunk that have been cut, avoiding their lateral fall.

[0099] Advantageously, the handling is passive, that is, the operator is the one displacing the articulated arms 2, but it is also possible to provide motorized joints, which facilitate the handling of the articulated arms 2 and their components.

[0100] To facilitate this operation, the contact and coupling element 20 consists of a box-like element, with walls configured to protect the hands of a possible operator.

[0101] The operator can grasp each contact and coupling element 20 through the gripping element 202 and can ensure that the element 20 engages with the trunk through special hooks 201, provided on the side of the coupling and contact element 20 facing in the trunk direction, in operating condition.

[0102] The gripping element 202 can integrate switches or similar components, so as to activate the stroke of the cutting wedge 12: the operator blocks, through the elements 20, the trunk in the cutting position, i.e. at the vertical pillar 10, he activates the stroke of the cutting wedge 12, so as to subdivide the trunk, as described above in relation to the vertical log splitters known to the state of the art.

[0103] While the invention is susceptible to various modifications and alternative constructions, some preferred embodiments have been shown in the drawings and described in detail.

[0104] It should be understood, however, that there is no intention to limit the invention to the specific illustrated embodiment but, on the contrary, the aim is to cover all

the modifications, alternative constructions and equivalents falling within the scope of the invention as defined in the claims.

[0105] The use of "for example", "etc.", "or" indicates non-exclusive alternatives without limitation, unless otherwise indicated.

[0106] The use of "includes" means "includes but is not limited to", unless otherwise stated.

Claims

1. Vertical log splitter comprising a vertical pillar (10) and a cutting wedge (12), which is mounted translatable along the longitudinal axis of said vertical pillar (10), in such a way that the displacement of said cutting wedge (12) allows a trunk positioned at the vertical pillar (10) to be subdivided into two or more parts,

   means for retaining the trunk in place being provided,
   means for activating the displacement of said cutting wedge (12) being present,
   characterized in that
   the retaining means consist of two articulated arms (2), mounted on the sides of said vertical pillar (10),
   each articulated arm (2) comprising at least one element of contact and coupling with the trunk (20), which contact and coupling element (20) is connected to a lever through a first joint (25), said lever being connected to the vertical pillar (10) through a second joint (23),
   the first joint (25) being configured at least to allow a rotation of the contact and coupling element (20) around the axis of the lever,
   the second joint (23) being configured to allow the displacement of the coupling and contact element (20) according to at least one degree of freedom.

2. Vertical log splitter according to claim 1, wherein said lever consists of a first lever arm (21) connected with a first end to the contact and coupling element (20) and with a second end to a second lever arm (22) through a third joint (24), the second lever arm (22) being connected to the vertical pillar (10) through the second joint (23).

3. Vertical log splitter according to claim 2, wherein said third joint (24) is configured to allow relative handling between the first (21) and the second (22) lever arm according to at least one degree of freedom.

4. Vertical log splitter according to one or more of the preceding claims, wherein said first joint (25) consists of a spherical joint.

5. Vertical log splitter according to one or more of the preceding claims, wherein said second joint (23) allows the handling of the lever according to two degrees of freedom, respectively according to a rotation around its longitudinal axis and a translation of the contact and coupling element (20) on a horizontal plane.

6. Vertical log splitter according to one or more of the preceding claims, wherein said contact and coupling element (20) comprises a gripping element (202) configured to allow gripping by an operator.

7. Vertical log splitter according to claim 6, wherein the means for activating the displacement of the cutting wedge are placed at said gripping element (202) .

8. Trunk containment and handling system for vertical log splitters, comprising a vertical pillar (10) and a cutting wedge (12), which is mounted translatable along the longitudinal axis of said vertical pillar (10), in such a way that the displacement of said cutting wedge (12) allows a trunk positioned at the vertical pillar (10) to be subdivided into two or more parts,

   which system comprises means for retaining the trunks in place and means for fixing said retaining means to the vertical pillar (10),
   characterized in that
   the retaining means are made according to one or more of claims 1 to 7.

9. System according to claim 8, wherein said fixing means consist of removable fixing means.

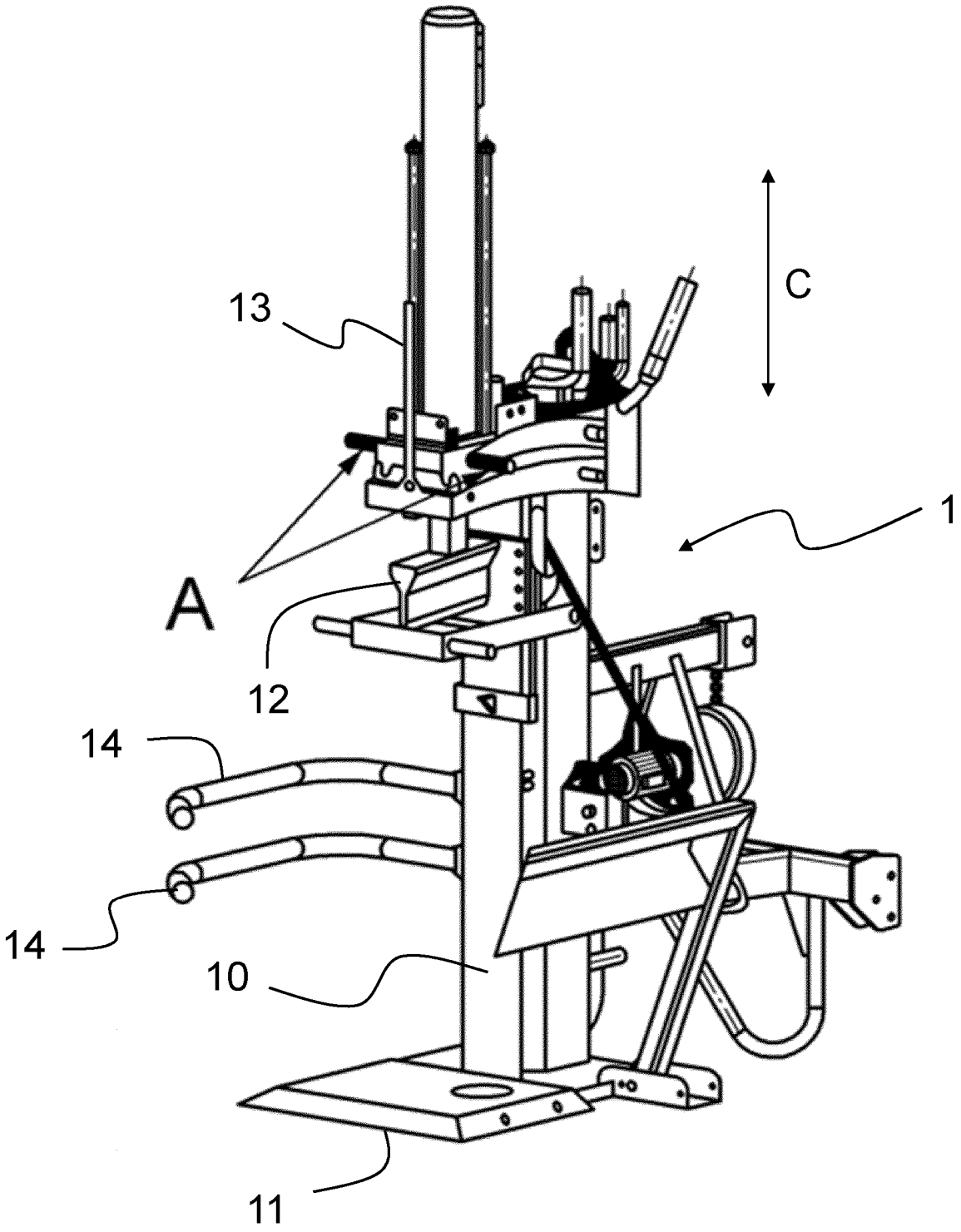

Fig. 1a

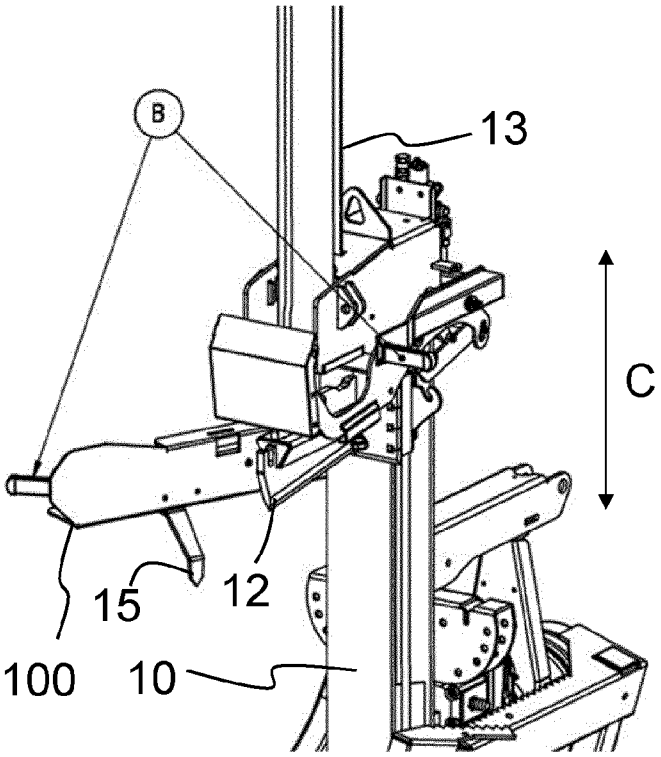

Fig. 1b

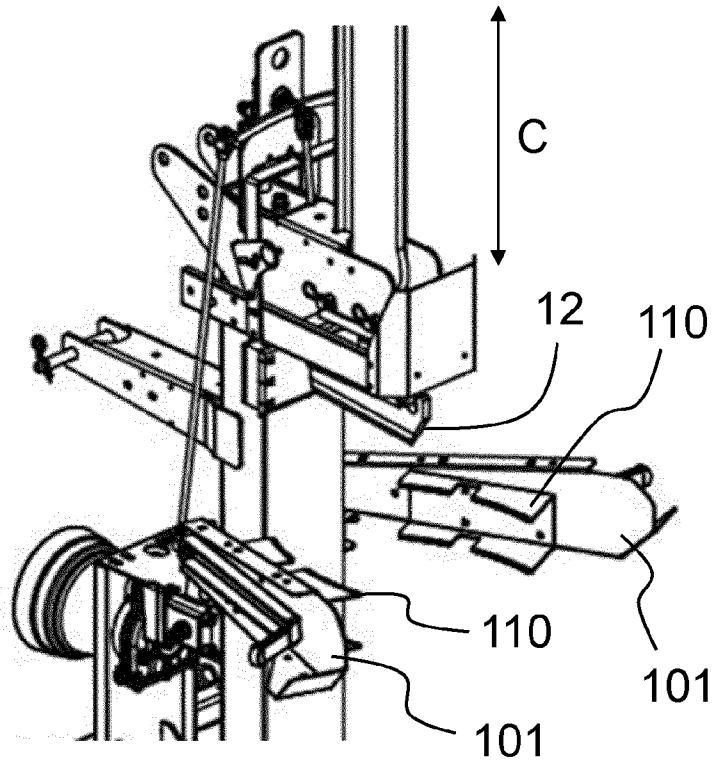

Fig. 1c

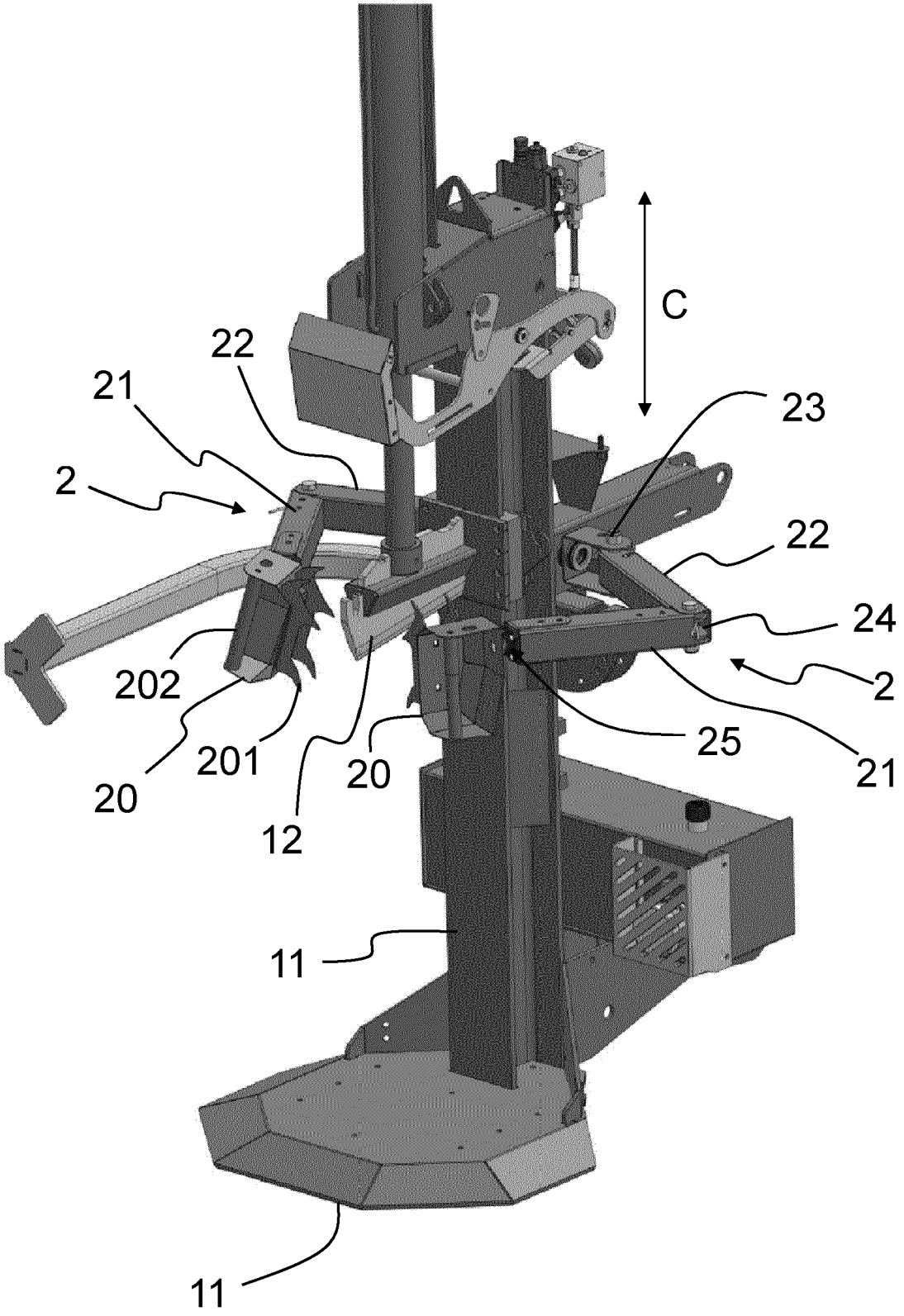

Fig. 2a

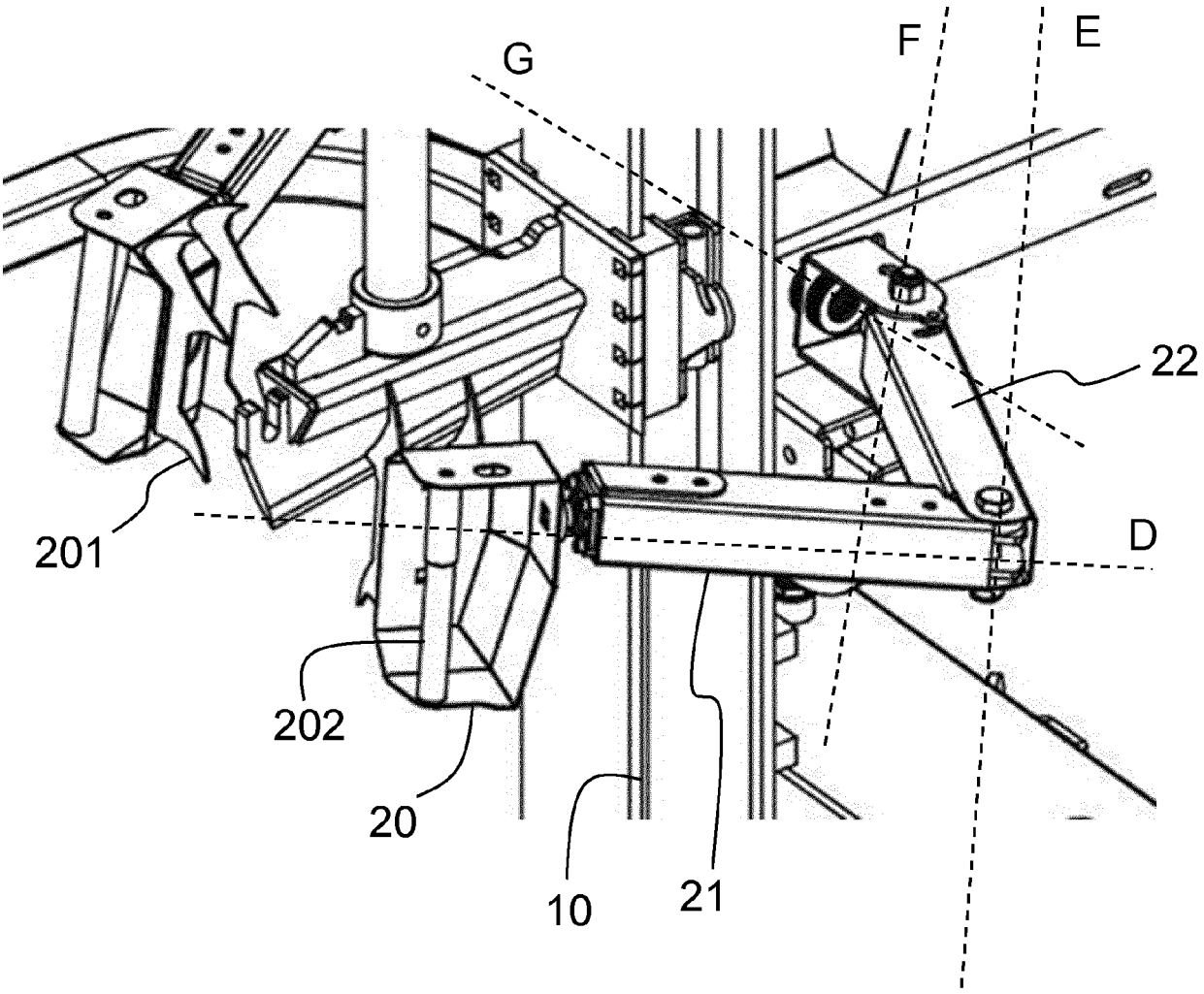

Fig. 2b

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EUROPEAN SEARCH REPORT

Application Number
EP 24 20 0078

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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A	* claims; figures *	5	
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A	* claims; figures *	5,6	TECHNICAL FIELDS SEARCHED (IPC)
			B27L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	2 December 2024	Hamel, Pascal

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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