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(54) **IMPROVED SLIDING PLATES FOR A LOG SPLITTER AND A LOG SPLITTER WITH SAID SLIDING PLATES**

(57) The present invention belongs to the field of forestry and wood processing, more precisely to the field of devices for splitting logs having special sliding plates for guides, along which the base plate of the axe slides. The present invention relates to improved sliding plates for a log splitter and a log splitter with said sliding plates.

The essence of the invention is in that the sliding plates are made of a combination of base material and from 0.5 to 80 % (w/w) of graphite or graphene, which improves the sliding characteristics of the plates. The base material may be brass, different plastic materials or any other suitable material. Sliding plates may be produced by adding graphite to the base material during manufacturing of the plates or graphite is included in the form of graphite inserts or layers to the already made plates. Alternatively, the graphite may be added to the base plate of the axe or the guides of the log splitter. Thus, the invention eliminates the need for lubrication of guides in a log splitter.

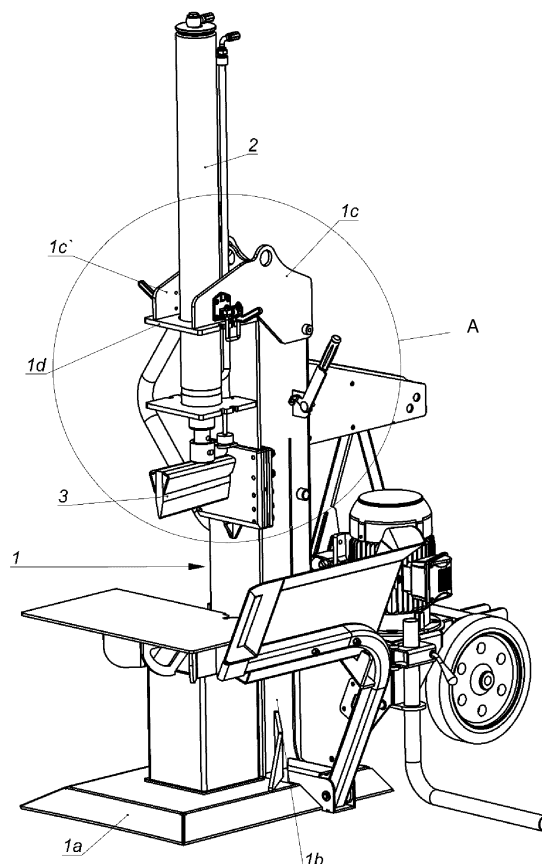


Figure 1

Description

Field of the invention

[0001] The present invention belongs to the field of forestry and wood processing, more precisely to the field of devices for splitting logs having special sliding plates for guides, along which the base plate of an axe slides. The present invention relates to improved sliding plates for a log splitter and a log splitter with said sliding plates.

The technical problem

[0002] The technical problem, which is solved by the present invention, is a constructional solution of sliding plates forming a part of a base plate of an axe for a log splitter, wherein the sliding plates have to enable smooth movement of the base plate along the vertical axis of the log splitter. The problem created during said movement along the guides is constant lubrication, intended to prevent wear of the sliding plates due to friction. The same problem is also present in horizontal log splitters.

State of the art

[0003] Slovenian patent SI25042 describes the problem of guide lubrication in log splitters. Throughout operation of a log splitter, lubrication of the guide is necessary at each splitting action, during which the pushing piston is moved backwards and forwards on the guide. Dirt may stick to the guide during movement of the piston, which leads to increased wear of the guide, especially in environments with high moisture. Said wear could be reduced if the guides were constantly lubricated so that the head with the axe could move more easily. Lubrication can be ensured with a suitable construction of the guide, which includes opening and closing of nozzles for delivering oil. This concept differs from the present invention.

[0004] Patent databases contain no solutions, which address sliding plates for vertical log splitters. Commercially available log splitters produced by the company Lancman have axes welded to plates, which slide along the vertical pillar of the splitter. Commercially available log splitters of companies Uniforest and Krpan do not solve the problem of lubrication of sliding plates.

[0005] US patent application number US 2014/0124097 A describes a log splitter comprising guides installed in a supporting frame, wherein a carrier plate with an axe comprising peeling plates on both sides moves along the said guides. The peeling plates enable simultaneous removal of the tree bark and splitting. This solution does not allow lubrication of the carrier plate as is the case in the present invention.

[0006] In everyday work lubrication of guides is often forgotten or neglected, while at the same time the lubrication oil also attracts impurities created during use of the log splitter. It is thus desired to eliminate the need for lubrication of guides.

Description of the solution of the technical problem

[0007] The essence of improved sliding plates for a log splitter is in that the plates are made of a combination of base material and from 0.5 to 80 % (w/w) graphite or graphene, which improves the sliding characteristics of plates and eliminates the need for lubrication of guides in the log splitter. The base material for sliding plates is preferably brass, different plastic materials or any other suitable material. The said combination of materials improves the life span of the sliding plates.

[0008] The sliding plates according to the invention may be produced in different manners. 0.5 to 80 % (w/w) of graphite may be added to the base material during manufacture of plates. Graphite may also be added to already manufactured plates in a form of inserts, wherein the inserts represent 0.5 to 80 % (w/w) of the material. A third option is to add a thin layer of graphite to one surface of the plate, wherein the amount of graphite is between 0.5 and 80 % (w/w). Preferably, the thin layer of graphite on the plate is prepared by pouring the material in a suitable mould. Graphene is a solid material composed of pure carbon, where the atoms are distributed in the form of regular hexagons similar to graphite, but with a thickness of one atom, and can be used instead of graphite, preferably in the form of a thin layer on sliding plates.

[0009] An alternative solution, according to which the sliding plates are not needed, is that the graphite or graphene is added to the base plate, to which the axe of a log splitter is attached. Graphite or graphene is only needed on the surface, which moves along the guide, wherein graphite or graphene is added during manufacture in the same way as described above. One other option is that graphite may also be added to already manufactured base plate of the axe in a form of inserts, wherein the inserts represent 0.5 to 80 % (w/w) of the material. Another option is to add a thin layer of graphite to one surface of the base plate of the axe, wherein the amount of graphite is between 0.5 and 80 % (w/w). The thickness of the layer may be one tenth to one half of the width of the base plate. Graphene is preferably added to the base plate of the axe in the form of a thin layer.

[0010] A third alternative solution is addition of 0.5 to 80 % (w/w) of graphite in one strip (for example in the middle) or two or more strips (for example at the sides) to the guide of the log splitter. Graphite or graphene may be added in the same way as described above, hence during manufacture, as inserts or as a thin layer. As the guide is longer than the base plate of the axe, this solution is more expensive, especially for the embodiment with graphene.

[0011] The above described improved sliding plates with graphite or graphene, and/or the base plate of the axe with graphite or graphene, and/or the guide with graphite or graphene may be easily installed into different types of log splitters. One embodiment of the invention is in that for guiding and moving the base plate of the axe along the guide two pairs of sliding plates with one sur-

face comprising graphite or graphene are used, wherein the surface with graphene or graphite is facing the guide of the log splitter. In case graphite or graphene are added to the base plate of the axe or to the guide, sliding plates are not necessary, but can still be present. Graphite or graphene has to be present on the surface of the base plate of the axe, which is in contact with the guide.

[0012] The essence of the log splitter with improved sliding plates according to one embodiment of the invention is in that a first pair of sliding plates is in a direct contact with the base plate for carrying the axe, the base plate moving along the guide, wherein the sides of the guide move along two parallel distancing elements and a second pair of sliding plates. The sliding plates and said distancing elements together with mounting plates are fixed with screws, which are inserted into holes prepared in said elements. The number of holes is arbitrary, preferably there are five. In addition, a pair of thin distancing elements may be provided between the distancing elements and the second pair of sliding plates, in order to reduce airiness between sliding plates and sliding guide, which is created due to use of the log splitter. Said thin distancing elements may also be provided between the first pair of the sliding plates and the distancing element, but their removal is more complicated, hence the embodiment where thin distancing elements are provided between the second pair and the distancing element is preferred.

[0013] The log splitter with improved sliding plates, the base plate or the guide according to the invention is a machine, which may be driven via a PTO shaft of a tractor or with an electromotor. The log splitter may be designed as a vertical or horizontal machine for splitting logs.

[0014] The log splitter with improved sliding plates according to the invention will be described in further detail based on embodiments and figures, which show:

- Figure 1 the log splitter with improved sliding plates according to the invention
- Figure 2 detail A
- Figure 3 exploded view of the axe and sliding plates

[0015] A possible embodiment of the invention is a vertical log splitter having a frame 1, wherein in the upper part of the frame 1 a cylinder 2 with a piston 21 is mounted. The piston 21 is installed in a cylindrical attachment 31 welded to an axe 3. The inner side of the axe 3 is welded to an axe carrier (also called base) plate 4, which is parallel to an essentially straight guide 1b' of a vertical pillar 1b of the frame 1. As shown in figures 1 and 2, the vertical log splitter has on its bottom part of the frame 1 a base 1a, on which the vertical pillar 1b stands. On its left and right side, the upper part of the pillar 1b is surrounded with carrier sides 1c and 1c' of a plate 1d, through which the cylinder 2 with the piston 21 is installed. The guide 1b' is essentially a straight side of the vertical pillar 1b and may have two narrow convex sides 1b".

[0016] The log splitter with improved sliding guides ac-

cording to the invention is preferably constructed so that a first pair of sliding plates 5, 5' is in direct contact with the base (carrier) plate 4, which moves along the convex sides 1b" of the guide 1b' limited between two parallel distancing elements 6, 6', and a second pair of sliding plates 8, 8', which are parallel to the first pair of the sliding plates 5, 5'. Additionally, a pair of thin distancing elements 7 and 7' may be provided between the distancing elements 6 and 6' and between the second pair of the sliding plates 8 and 8'. The function of the thin distancing elements is important when sliding plates despite the presence of graphite or graphene start showing wear and thin out. Upon thinning of the sliding plates airiness between the sliding plates and the guide may increase. When thin distancing elements are present in the log splitter, said airiness can be reduced with removal of the said thin distancing elements. Thus, enhanced movement or sliding along the guide is ensured for longer periods of use.

[0017] As shown in figure 3 the base plate 4 has a rectangular shape and is on one side provided with preferably five first holes 4a and is provided with five second holes 4a' on the other side. The axe 3 is mounted perpendicularly to the plate 4, wherein the inner side of the axe is welded to the plate 4. One side of the base plate 4 is provided with the first sliding plate 5 with third holes 5a, which are coaxial with first holes 4a, while the other side of the plate 4 the second sliding plate 5' with fourth holes 5a' is provided, the fourth holes 5a' being coaxial with second holes 4a'.

[0018] Parallel to the first pair of sliding plates 5 and 5' distancing elements 6 and 6' are provided, between said distancing element the guide 1b' with convex sides 1b" of the vertical pillar 1b forming the frame of the log splitter, can move. The first distancing element 6 preferably has five fifth holes 6a, which are coaxial with first holes 4a on one side of the plate 4 and third holes 5a of the first sliding plate 5. The second distancing element 6' preferably has five sixth holes 6a', which are coaxial to second holes 4a' on the other side of the plate 4 and fourth holes 5a' of the second sliding plate 5'. Parallel to the first pair of distancing elements 6 and 6' the pair of thin distancing elements 7 and 7' is provided. The first thin distancing element 7 preferably has five seventh holes 7a, which are coaxial with fifth holes 6a of the first distancing element 6. The second thin distancing element 7' preferably has five eighth holes 7a', which are coaxial with sixth holes 6a' of the second distancing element 6'.

[0019] Parallel to the thin distancing elements 7 and 7' the second pair of sliding plates 8 and 8' is provided. The third sliding plate 8 preferably has five ninth holes 8a, which are coaxial with seventh holes 7a of the thin distancing element 7. The fourth plate 8' preferably has five tenth holes 8a', which are coaxial with eighth holes 7a' of the thin distancing element 7'.

[0020] Parallel to the second pair of sliding plates 8 and 8' a first of mounting plates 9 and 9' is provided. The first mounting plate 9 preferably has five eleventh holes 9a, which are coaxial with ninth holes 8a of the third slid-

ing plate 8. The second mounting plate 9' preferably has five twelfth holes 9a', which are coaxial with tenth holes 8a' of the fourth sliding plate 8'.

[0021] On one side of the base plate 4 five hexagonal screws 10a are installed through the holes 9a, holes 8a, holes 7a, holes 6a, holes 5a, holes 4a in order to screw together the first mounting plate 9, the third sliding plate 8, the first thin distancing element 7, the first distancing element 6 and the first sliding plate 5. On the other side of the base plate 4 five hexagonal screws 11a are installed through the holes 9a', holes 8a', holes 7a', holes 6a', holes 5a', holes 4a' in order to screw together the second mounting plate 9', the fourth sliding plate 8', the second thin distancing element 7', the second distancing element 6' and the second sliding plate 5'.

[0022] The above described solutions of the improved sliding plates, the base plate or the guide of the log splitter enable use of different combinations of materials for base and sliding plates, which allows the manufacturer to design different types of log splitters based on use requirements, but without the need for lubrication.

Claims

1. A sliding plate for a log splitter, **characterized in that** the sliding plate is made of a combination of base material, which is preferably brass, plastic or any other suitable material, and from 0.5 to 80 % (w/w) graphite or graphene.
2. A base plate of an axe for a log splitter, **characterized in that** the surface of the base plate oriented towards a guide of a log splitter, is made of a combination of base material, which is preferably brass, plastic or any other suitable material, and from 0.5 to 80 % (w/w) graphite or graphene.
3. A guide for a log splitter, **characterized in that** the guide is made of a combination of base material, which is preferably brass, plastic or any other suitable material, and from 0.5 to 80 % (w/w) graphite or graphene.
4. The sliding plate, the base plate of an axe or the guide for a log splitter according to any of the claims from 1 to 3, made so that graphite is added to the base material during manufacturing of the plates or guides.
5. The sliding plate, the base plate of an axe or the guide for a log splitter according to any of the claims from 1 to 3, made so that graphite is added to one surface of already manufactured plates in the form of inserts.
6. The sliding plate, the base plate of an axe or the guide for a log splitter according to claim 5, wherein

the inserts may have any shape.

7. The sliding plate, the base plate of an axe or the guide for a log splitter according to any of the claims from 1 to 3, made so that graphite or graphene is added to one surface of already manufactured plates or the guide in the form of a thin layer.
8. A log splitter comprising two pairs of sliding plates and/or the base plate of an axe and/or the guide according to any of the preceding claims.
9. The log splitter according to claim 8, which may be a vertical or a horizontal splitter and is driven via a PTO shaft of a tractor or an electromotor.
10. The log splitter according to claim 8 or claim 9, **characterized in that** it has a frame (1), wherein on the upper part of the frame (1) a cylinder (2) with a piston (21) is mounted; the piston (21) is installed in a cylindrical attachment (31), which is welded to an axe (3); the inner side of the axe (3) is welded to a base plate (4) of the axe, the plate (4) being parallel to a straight guide (1b') of a vertical pillar (1b) of the frame (1).
11. The log splitter according to any claim from 8 to 10, **characterized in that** a first pair of the sliding plates (5, 5') is in a direct contact with the base plate (4) of the axe and the guide (1b), the sides of the said guide (1b) move along two parallel distancing elements (6, 6') and a second pair of sliding plates (8, 8').
12. The log splitter according to claim 11, **characterized in that** it has a pair of thin distancing elements (7, 7') between distancing elements (6, 6') and the second pair of sliding plates (8, 8').
13. The log splitter according to any claim from 8 to 12, **characterized in that** the base plate (4) is rectangularly shaped and has on one side preferably five first holes (4a) and five second holes (4a') on the other side; that perpendicularly to the base plate (4) the axe (3) is mounted, the inner side of the axe (3) being welded to the plate (4); that on one side of the base plate (4) the first sliding plate (5) with third holes (5a) coaxial with first holes (4a) is parallelly mounted, and that on the other side of the plate (4) the second sliding plate (5') with fourth holes (5a') coaxial with second holes (4a') is parallelly mounted; that in parallel to the first pair of sliding plates (5 and 5') the first pair of distancing elements (6 and 6') is provided, between which the guide (1b') with convex sides (1b'') of the vertical pillar 1(b) forming the frame of the log splitter can move; that the first distancing element (6) preferably has five fifth holes (6a) coaxial with first holes (4a) on one side of the plate (4) and third holes (5a) of the first sliding plate (5); that the

second distancing element (6') preferably has five sixth holes (6a') coaxial with second holes (4a') on the other side of the plate (4) and fourth holes (5a') of the second sliding plate (5'); that parallel to the first pair of distancing elements (6 and 6') the pair of thin distancing elements (7 and 7') is provided; that the first thin distancing element (7) preferably has five seventh holes (7a) coaxial with the fifth holes (6a) of the first distancing element (6); that the second thin distancing element (7') has preferably five eighth holes (7a') coaxial with sixth holes (6a') of the second distancing element (6'); that parallel to the pair of thin distancing elements (7 and 7') the second pair of sliding plates (8 and 8') is mounted; that the third sliding plate (8) preferably has five ninth holes (8a) coaxial with seventh holes (7a) of the first thin distancing element (7); the fourth sliding plate (8') preferably has five tenth holes (8a') coaxial with eighth holes (7a') of the second thin distancing element (7'); that parallel to the second pair of sliding plates (8 and 8') a pair of mounting plates (9 and 9') is provided; that the first mounting plate (9) preferably has five eleventh holes (9a) coaxial with ninth holes (8a) of the third sliding plate (8); that the second mounting plate (9') preferably has five twelfth holes (9a') coaxial with tenth holes (8a') of the fourth sliding plate (8'); that on one side of the base plate five hexagonal screws (10) are installed through the holes (9a, 8a, 7a, 6a, 5a, 4a) in order to screw together the first mounting plate (9), the third sliding plate (8), the first thin distancing element (7), the first distancing element (6) and the first sliding plate (5); that on the other side of the base plate (4) five hexagonal (11a) are installed through the holes (9a', 8a', 7a', 6a', 5a', 4a') in order to screw together the second mounting plate (9'), the fourth sliding plate (8'), the second thin distancing element (7'), the second distancing element (6') and the second sliding plate (5').

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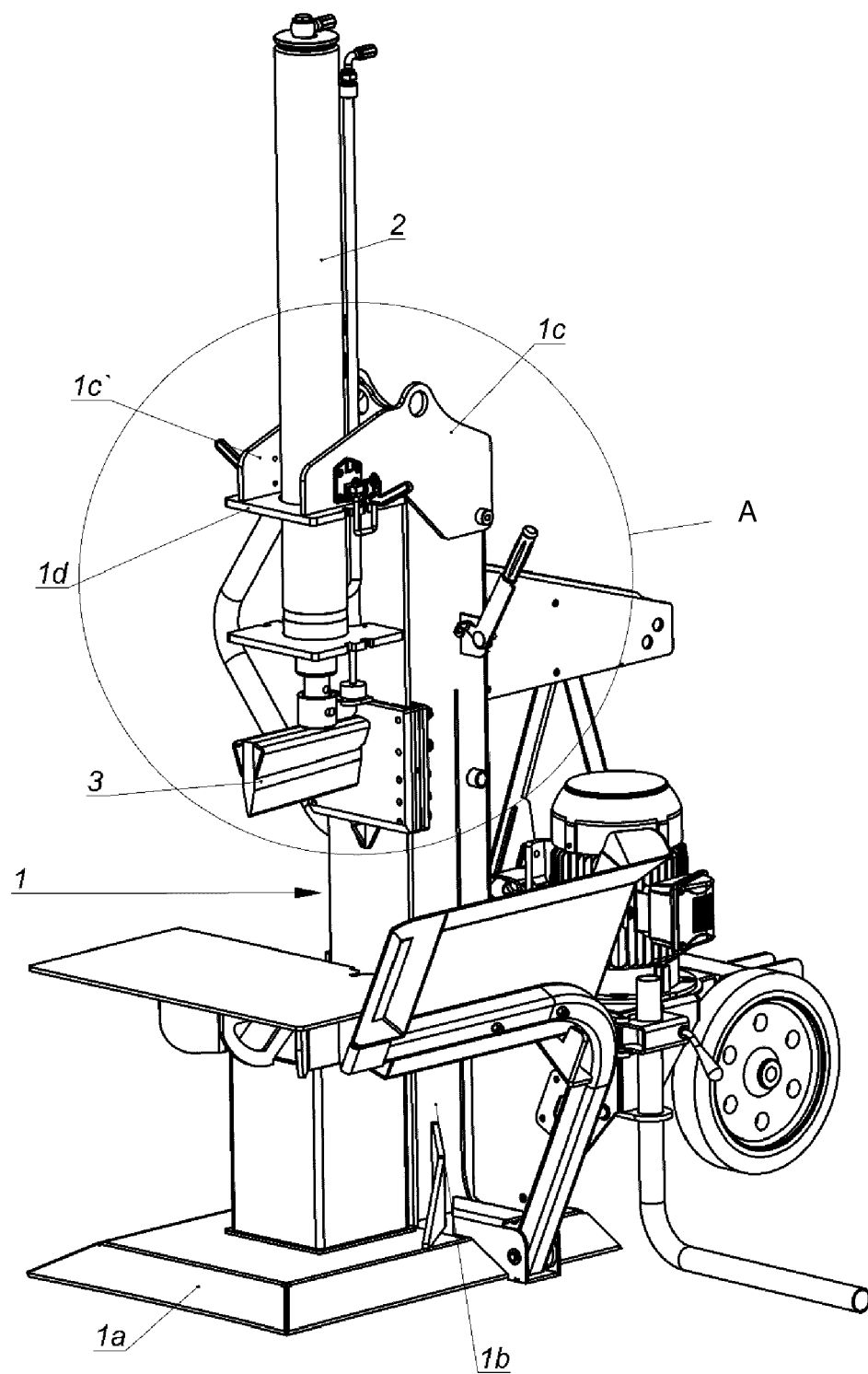


Figure 1

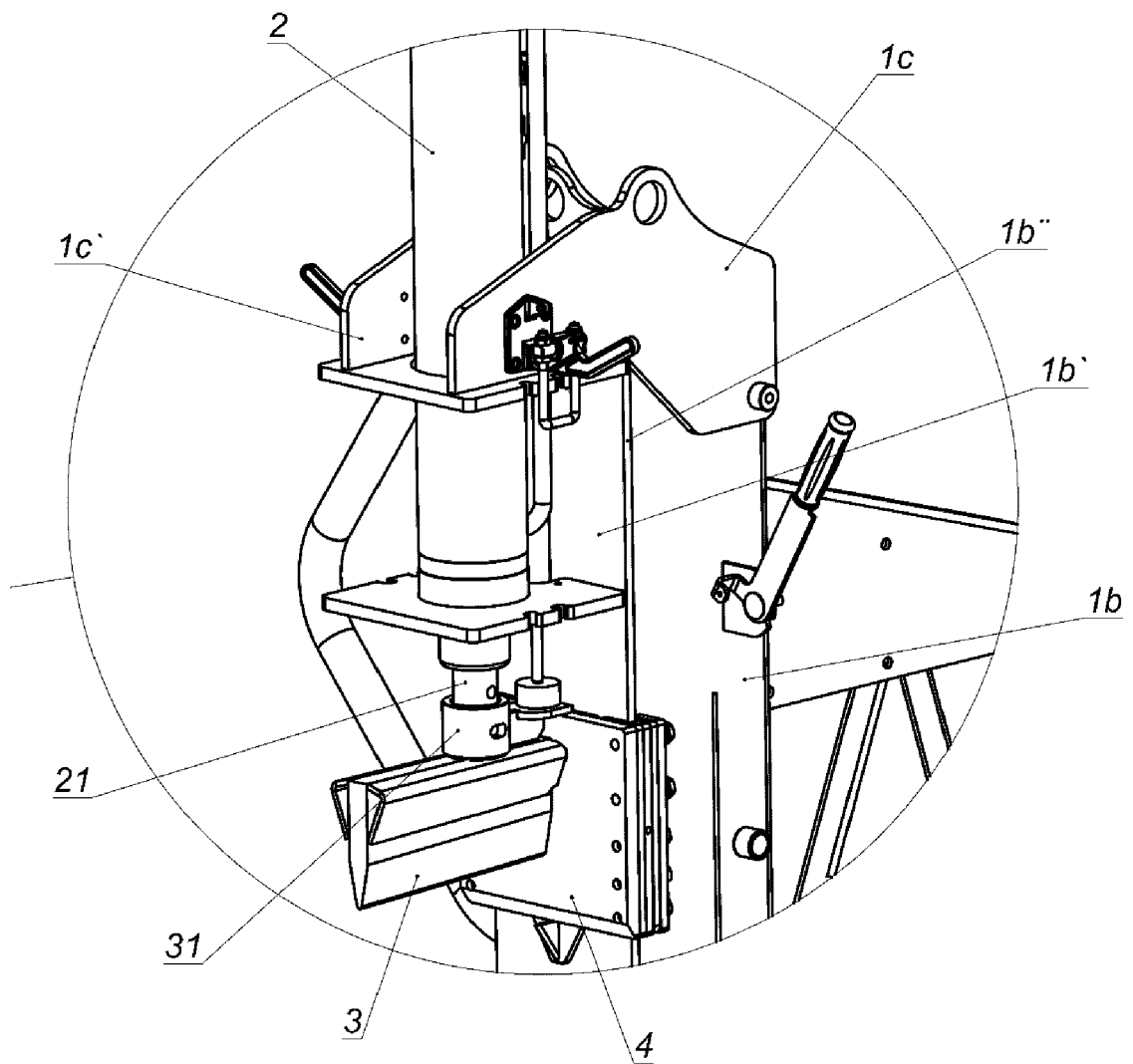


Figure 2

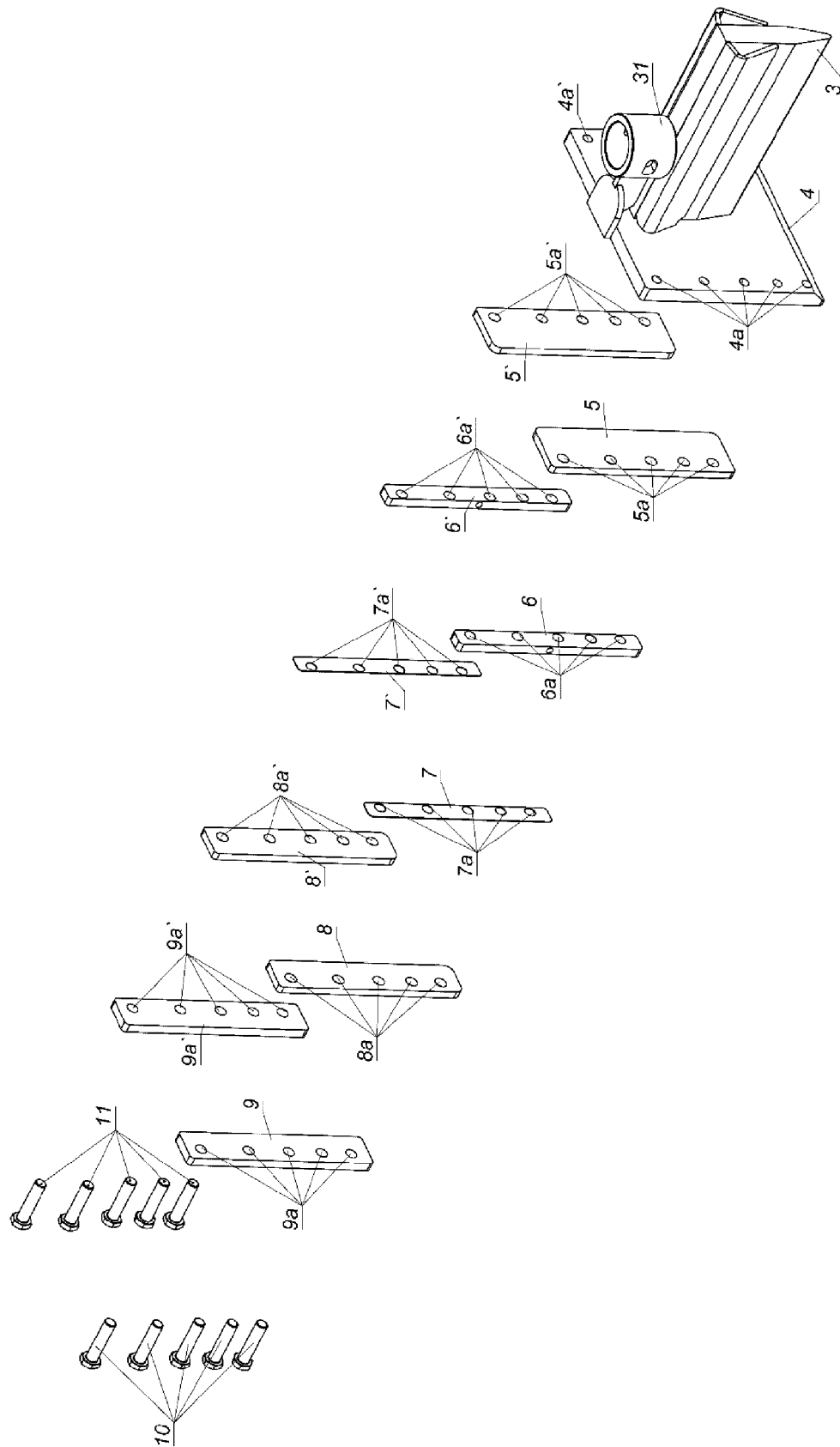


Figure 3



EUROPEAN SEARCH REPORT

Application Number
EP 19 18 5953

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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	EP 3 332 931 A1 (TOBIAS DUERDOTH [DE]) 13 June 2018 (2018-06-13)	3-6,8	INV. C10M103/02 B27L7/06
Y	* paragraphs [0001] - [0006], [0055], [0071] * * figures 2,10 *	1-13	
Y	----- US 4 782 870 A (DUERR DENNIS [US]) 8 November 1988 (1988-11-08) * abstract * * column 3, line 37 - column 4, line 8 * * claim 4; figures 1-3, 6, 7 *	1-13	
A	----- US 2011/079323 A1 (GREEN KEVIN J [US]) 7 April 2011 (2011-04-07) * abstract * * paragraphs [0023] - [0025], [0034] - [0036] * * figures 1,8 *	1-13	
Y	----- DE 10 2012 215666 A1 (SCHAEFFLER TECHNOLOGIES AG [DE]) 6 March 2014 (2014-03-06) * paragraphs [0004] - [0008], [0012], [0024] * * claims; figure *	1-3,7	TECHNICAL FIELDS SEARCHED (IPC) C10M C10N B27M B27L F16C
A	----- EP 0 469 906 A1 (OILES INDUSTRY CO LTD [JP]) 5 February 1992 (1992-02-05) * abstract; claims *	1-13	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 13 December 2019	Examiner Keipert, Olaf
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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ON EUROPEAN PATENT APPLICATION NO.**

EP 19 18 5953

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 3332931 A1	13-06-2018	DE 102016123602 A1 EP 3332931 A1	07-06-2018 13-06-2018
US 4782870 A	08-11-1988	NONE	
US 2011079323 A1	07-04-2011	NONE	
DE 102012215666 A1	06-03-2014	NONE	
EP 0469906 A1	05-02-1992	DE 69102741 D1 DE 69102741 T2 EP 0469906 A1 JP 2866457 B2 JP H0489891 A KR 920004551 A	11-08-1994 27-10-1994 05-02-1992 08-03-1999 24-03-1992 27-03-1992

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

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Patent documents cited in the description

- US 20140124097 A [0005]