(19) DANMARK

(10) **DK/EP 2949193 T3**

Patent- og Varemærkestyrelsen

(12) Oversættelse af europæisk patentskrift

(51) Int.Cl.: ***A 01 B 49/06 (2006.01)***

(45) Oversættelsen bekendtgjort den: **2020-01-02**

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2019-10-02**

(86) Europæisk ansøgning nr.: **15168659.9**

(86) Europæisk indleveringsdag: **2015-05-21**

(87) Den europæiske ansøgnings publiceringsdag: **2015-12-02**

(30) Prioritet: **2014-05-26 FR 1454721**

(84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**

(73) Patenthaver: **KUHN S.A., 4, Impasse des Fabriques, 67700 Saverne, Frankrig**

(72) Opfinder: **Teitgen, Hervé, 54, Route de Trois Maisons, 57370 PHALSBOURG, Frankrig**
Potier, Philippe, 3, Moderfeld, 67290 ZITTERSHEIM, Frankrig

(74) Fuldmægtig i Danmark: **Patrade A/S, Ceresbyen 75, 8000 Århus C, Danmark**

(54) Benævnelse: **Kombination af et primært redskab og af et sekundært redskab og fremgangsmåde til ophængning**

(56) Fremdragne publikationer:
DE-A1- 3 105 641
DE-A1- 3 636 015
FR-A1- 2 503 979
FR-A1- 2 533 408

Description

The present invention relates to the general technical field of agricultural machinery. The invention in particular relates to a combination of a primary tool and a secondary tool designed to be attached to the primary tool by means of two connecting devices, each connecting device including a hook and a stud designed to be inserted into the corresponding hook, one of the hooks being a front hook and the other being a rear hook taking into account the direction of advance. The invention also relates to the method for attaching the secondary tool to the primary tool.

The use of a combination comprised of a soil-working machine into which a seed drill is incorporated is known. The soil-working machine is, for example, a rotary harrow with tools driven in rotation around vertical axes. At the rear of these driven tools a reference element that allows the working depth to be controlled is arranged. This is a roller that compacts and completes the crumbling of the earth. The seed drill is incorporated into the rotary harrow such that it constitutes a compact assembly. The fastening of the seed drill to the rotary harrow is removable. The seed drill can therefore be separated to enable the rotary harrow to be used alone. The operation of attaching the seed drill to the rotary harrow is inconvenient. This operation is performed while the tractor is in reverse and it is necessary to accurately position the rotary harrow underneath the seed drill so that the studs can engage in the hooks open upwards. It is difficult to position the hooks and studs so that they are aligned, by advancing or reversing the tractor. The driver sometimes needs to get out of the tractor several times to observe whether it is too far forward or backward and ultimately correct the position in order to be able to hitch the seed drill to the rotary harrow. This is because visibility is very limited from the cabin of the tractor.

To reduce the amount of time that this hitching operation takes, a second person usually supervises the manoeuvre and guides the driver in order to reach the alignment position more quickly. When the rotary harrow is properly positioned underneath the seed drill, the driver activates the lifting device of the tractor to be able to engage the front stud of the seed drill in the front hook. He needs to find the correct height position of the lifting device to ensure that the stud is placed in the

hook in such a way that it can be locked. The locking operation must also be performed on the other side. He will then activate the lifting device again to engage the rear stud in the rear hook and enable the rear connecting device to be locked.

The document FR 2 533 408 discloses a combination of a primary tool equipped with a parallelogram-shaped articulation system with two hooks and a secondary tool having a three-point hitch with two hitching studs designed to be inserted into the two hooks. A rod acts as the upper hitching point. The hooks are positioned at the same level and there is no front hook or rear hook.

The present invention aims to overcome the aforementioned drawbacks. It is in particular designed to propose a combination in which the hitching of the integrated secondary tool is easier and faster. Another objective of the present invention is to ensure fast hitching of the secondary tool to the primary tool without another person being present.

To this end, an important feature of the invention consists of one of the hooks having a substantially horizontal positioning rail. Thanks to this feature, the hitching of the secondary tool to the primary tool is made easier, as the positioning rail directly guides the stud into the hook. The positioning rail is directed in the direction of hitching of the secondary tool to the primary tool. This means that the user only has to reverse until the stud comes to rest in the hook. The operations required to find and engage the studs in the respective hooks are reduced. Hitching is fast.

According to another feature, a guide rail extends the positioning rail. Thanks to this guide rail, the driver can anticipate the height placement of the primary tool and therefore of the hook so that the stud can enter into the hook via the positioning rail while reversing.

According to another feature of the invention, the U shape of the hook also has the advantage of blocking the linear movement of the stud in the two vertical directions, thereby guaranteeing a rotation around the stud to insert the second stud when the primary tool is lifted. When the primary tool is laterally aligned with the secondary tool, hitching is achieved easily, quickly and without the involvement of a second person.

Other features and advantages of the invention will become apparent from the following description with regard to the attached drawings, which are only provided as non-exhaustive examples of the invention. In these drawings:

- **figure 1** shows a side view of a combination of a primary tool onto which is hitched a secondary tool according to the present invention;
- **figure 2** is a side view during the phase of positioning the primary tool relative to the secondary tool;
- **figure 3** is a side view during the hitching of the secondary tool to the primary tool;
- **figure 4** is a detailed view during the phase of guiding the primary tool relative to the secondary tool.

Figure 1 shows the combination of a primary tool (1), hitched to the three-point hitch (2) of a tractor (3) and of a secondary tool (4) designed to be hitched to the primary tool (1). The tractor (3) moves and drives the combination of tools in a direction of advance indicated by the arrow (A) during work. In the remainder of the description, the following notions "front", "rear" and "in front of", "behind" are defined relative to the direction of advance (A). The primary tool (1) is a mounted tool. It includes a chassis (5) that carries work elements (6) and a reference element (7). The reference element (7) extends behind the work elements (6) and is used to control the working depth of the work elements (6). The secondary tool (4) is hitched to the primary tool (1) by means of two connecting devices (8a, 8b). The secondary tool (4) is fastened to the primary tool (1) using a front connecting device (8a) and a rear connecting device (8b). Such connecting devices (8a, 8b) are positioned on each side of the combination. Each connecting device (8a, 8b) includes a hook (10a, 10b) and a stud (11a, 11b). The stud (11a, 11b) is designed to be inserted into the corresponding hook (10a, 10b). The hooks (10a, 10b) and the studs (11a, 11b) are complementary parts. In most cases, the reference element (7) also controls the depth of the work devices (12) of the secondary tool (4). The front connecting device (8a) and the rear connecting device (8b) are advantageously positioned apart from each other to improve stability and reduce forces. In the description, the hook (10a, 10b) must be considered as an element that allows another element to be housed and fastened. It is a coupling hook.

The primary tool (1) and the secondary tool (4) are agricultural machines that are commonly used in combination. One performs preparation work and the other supplements and/or completes the work. For example, the primary tool (1) prepares the seed bed and the secondary tool (4) distributes a product in or on the prepared soil. The primary tool (1) extends in front of the secondary tool (4) given the direction of advance (A) for the work. The primary tool (1) is, for example, a passive tool whose work elements (6) are not driven by the power take-off shaft of the tractor (3), such as a tool equipped with discs or teeth. According to another example, the primary tool (1) is a driven rotary cutter or a driven harrow. In the example embodiment shown in the figures, the primary tool (1) is a rotary harrow whose work elements (6) are driven by the power take-off shaft. In addition to adjusting the depth, the reference element (7) compacts and supplements the crumbling of the earth. This is performed by a roller. The primary tool (1) is therefore a surface ploughing and seed bed preparation tool. The small size of this type of primary tool (1) enables it to be paired with a secondary tool (4) such as a distribution machine or a seed drill. The combination of the rotary harrow and the seed drill makes it possible to perform different operations during a single pass along a plot.

Figure 1 shows that the secondary tool (4) is vertically fastened to the reference element (7). The fact that the secondary tool (4) is vertically mounted to the reference element (7) makes it possible to reduce the required lifting power, as the centre of gravity of the combination is close to the tractor (3). The primary tool (1) fully supports the secondary tool (4). The secondary tool (4) includes a hopper forming the seedbank and work devices (12), which are designed to plant seeds in the prepared soil. The hopper extends at least partially above the reference element (7) and the work devices (12) extend behind the reference element (7). The planting depth of the work devices (12) is controlled by the reference element (7). As such, the secondary tool (4) is incorporated into the primary tool (1) so as to constitute a compact and versatile assembly. Soil preparation and seeding are performed in a single pass, which reduces the work time, limits compaction of the soil and reduces the mechanisation costs.

The fastening of the secondary tool (4) to the primary tool (1) is designed to be removable, such that the primary tool (1) can be used alone. The secondary tool (4) has stands (14) so that it can be uncoupled. The stands (14) are shown in dotted lines in figure 1, as they are taken off when the secondary tool (4) is locked to the primary tool (1).

According to an important feature of the invention, one of the hooks (10a, 10b) has a substantially horizontal positioning rail (9). One of the hooks (10a, 10b) is a front hook (10a) and the other is a rear hook (10b) given the direction of advance (A). The hitching of the secondary tool (4) to the primary tool (1) is made easier, as the positioning rail (9) directly guides the stud (11a, 11b) into the corresponding hook (10a, 10b). The positioning rail (9) is substantially directed in the direction of the hitching of the secondary tool (4) to the primary tool (1). The hitching direction corresponds to the tractor (3) reversing in the direction (B) that is in the opposite direction to the direction of advance (A). Thanks to the positioning rail (9), the stud (11a, 11b) is guided into its position at the bottom of the hook (10a, 10b). The operations required to engage the stud (11a, 11b) in the respective hook (10a, 10b) are therefore reduced.

According to a feature of the invention, one of the hooks (10a, 10b) is U-shaped. The positioning rail (9) constitutes one of the legs of the letter U. In the example embodiment, the hook (10a) of the front connecting device (8a) includes the positioning rail (9). This is therefore the front hook (10a). The front hook (10a) therefore has an opening to the rear. The shape of the front hook (10a) is a U on its side. The positioning rail (9) corresponds for example to the lower leg or upper leg of the front hook (10a). The role of the positioning rail (9) is to position and therefore guide the front stud (11a) vertically. Figure 2 shows the front stud (11a) engaged in the front hook (10a) thanks to the positioning rail (9). This means that the user only has to reverse until the front stud (11a) comes to rest in the front hook (10a).

For greater safety, the hooks (10a, 10b) should be locked when the respective studs (11a, 11b) are engaged by means of a bolt (13). Locking can be performed manually or automatically. A remote locking can also be envisaged. Preferably, at least one of the hooks (10a, 10b) locks automatically when the stud (11a, 11b) is

inserted into its corresponding hook (10a, 10b). Figure 3 shows the combination of the primary tool (1) and the secondary tool (4) in this position. Particularly advantageously, the front hook (10a) has a self-closing bolt. The front bolt (13a) opens when it faces the front stud (11a) and closes when it comes to rest in the front hook (10a). The front bolt (13a) is kept in a closed position by a spring system or a similar device. The rear bolt (13b), as shown in the figures, is closed, respectively opened manually using a pin. It is entirely possible to include a self-closing bolt.

According to the figures, one can see that the front hook (10a) is open to the rear and that the rear hook (10b) is open in a vertical direction. The rear hook (10b) is open upwards. The rear hook (10b) belongs to the primary tool (1). The plane passing through the median plane (19a) of the opening of the front hook (10a) crosses the plane passing through the median plane (19b) of the opening of the rear hook (10b). According to figure 1, the median plane (19a) of the front hook (10a) is located in the middle of the U-shaped front hook (10a). The median plane (19a) extends mid-distance between the upper leg and the lower leg of the U. The two planes (shown in dotted lines) cross each other in a straight line shown in figure 1 by the point (18). Viewed transversely, this point (18) must extend in the upward bulk of the combination. In another example embodiment, the rear hook (10b) has a downward opening. In this case, the rear hook (10b) is provided on the secondary tool (4) and the rear stud (11b) on the primary tool (1).

In the example shown, the positioning rail (9) of the front hook (10a) is dual, as the positioning is performed by the lower leg and the upper leg. To make engagement easier, the end of the upper leg is slightly apart from the end of the lower leg. When the front stud (11a) is positioned in the front hook (10a), movement in the two vertical directions is blocked. The user therefore only has to lift the primary tool (1) via the three-point hitch (2) to engage the rear stud (11b) in the rear hook (10b). Given that translational movements in the vertical direction are blocked, the secondary tool (4) swivels around the front stud (11a) during lifting. To make the engagement of the rear stud (11b) in the rear hook (10b) easier, the latter has a V-shaped opening. To ensure that swivelling takes place in the correct direction around the front stud (11a), the centre of gravity of the secondary tool (4) must be opposite the front connecting device (8a), i.e. at the level of the rear hook

(10b). Preferably, the centre of gravity extends in the vertical plane, perpendicular to the direction of advance (A), passing through the rear hook (10b) or behind this vertical plane.

Advantageously, the front hook (10a) and the rear hook (10b) extend in a same vertical plane parallel to the direction of advance (A). In an alternative, the front hook (10a) is laterally offset relative to the rear hook (10b).

According to another important feature, a guide rail (15) extends the positioning rail (9). Thanks to this guide rail (15), the user can anticipate the height placement of the primary tool (1) and therefore of the front hook (10a) so that the front stud (11a) can enter into the front hook (10a) via the positioning rail (9) while reversing. The hitching is therefore made even easier. The guide rail (15) extends between the front hook (10a) and the rear hook (10b). The length of the guide rail (15) corresponds to at least one third of the distance between the front hook (10a) and the rear hook (10b). In the example shown in figure 4, the front stud (11a) slides on the guide rail (15) to get, while the tractor (3) is reversing, on the positioning rail (9) and finally the bottom of the front hook (10a). The stands (14) are not shown in this figure. The guide rail (15) is rectilinear. It is substantially horizontal and is slightly sloped downwards. In an alternative not shown, the guide rail (15) is curved in a preferably concave shape. The figures show that the rear hook (10b) extends below the guide rail (15) and that the front hook (10a) extends substantially above the guide rail (15).

In practice, the secondary tool (4) is hitched to the primary tool (1) in several steps. Figure 1 shows the secondary tool (4) or the seed drill hitched to the primary tool (1) or to the rotary harrow. The three-point hitch (2) of the tractor (3) is shown in its raised position. In the first step, the primary tool (1) is hitched to the tractor (3) and the secondary tool (4) rests on the ground by means of the stands (14). To encourage the front stud (11a) to engage in the front hook (10a) while reversing, the secondary tool (4) is tilted forwards. As such, when the secondary tool (4) is placed on its stands (14), the rear stud (11b) is offset upwards relative to the front stud (11a). In the second step, the user reverses in a direction (B) to position the primary tool (1) underneath the secondary tool (4). He reverses, aligning the primary tool (1) with the secondary tool (4) in a direction crossing the direction (B). The support

structure of the secondary tool (4) includes guides for this purpose on either side. The three-point hitch (2) is positioned so that the primary tool (1) is sufficiently raised so as to not touch the ground and sufficiently lowered so as to pass underneath the secondary tool (4). When the primary tool (1), in particular the reference element (7), arrives underneath the secondary tool (4), the front stud (11a) must be engaged in the front hook (10a) via the positioning rail (9). When the front stud (11a) comes to rest in the front hook (10a), the tractor stops reversing. Preferably, the position of the front stud (11a) is then automatically locked in the front hook (10a). The user can anticipate the height adjustment of the primary tool (1) relative to the secondary tool (4) using the guide rail (15). During this second step, the secondary tool (4) remains resting on the ground by means of the stands (14).

In the third step, the user raises the primary tool (1) to engage the rear stud (11b) in the rear hook (10b). The three-point hitch (2) is activated until the secondary tool (4) is raised, i.e. the stands (14) are lifted off the ground and can be removed. For greater safety during this step, it is recommended to lock the front hook (10a) to ensure that the secondary tool (4) rotates around the front stud (11a).

In the last step, the rear stud (11b) must be locked in the rear hook (10b). This locking is performed manually via the rear bolt (13b) on each side of the secondary tool (4).

In the example embodiment shown in the figures, the secondary tool (4) is a seed drill and the primary tool (1) is a rotary harrow with rotors equipped with two teeth. The reference element (7) is a roller designed to compact the soil and control the working depth of the teeth. In the specific case of the fixed mounting of the seed drill on the reference element (7), it is necessary to articulate the roller-seed drill assembly relative to the chassis of the rotary harrow. The roller is connected to the chassis of the rotary harrow by two side arms. The upper part of the seed drill is connected to the rotary harrow via a rod (16). The next step is to remove the pin (17) to free the parallelogram formed by the rod (16) and the roller arm. Advantageously, this pin (17) is used to lock the rear hook (10b). To hitch the seed drill to the rotary harrow, the steps previously described are followed and certain steps are added to ensure the correct operation of the integrated seed drill. As such,

at the end of the second step, the rod (16) of the secondary tool (4) is fastened to the primary tool (1). This rod (16) is carried out in the form of a coupling rod or a hydraulic jack. The pin (17) must then be removed in order for the seed drill to be articulated to the rotary harrow. The seed drill is mounted on the reference element (7) in a fixed manner. The pin (17) that was withdrawn from the arm of the roller will make it possible to carry out the second step, i.e. to lock the rear connecting device (8b). Needless to say, the pin (17) is removed from each arm of the roller.

In an alternative not shown, the secondary tool (4) is a precision seed drill or a spreader.

It is clear that the invention is not limited to the example embodiments described above and shown in the attached drawings. Modifications are possible, particularly concerning the composition or number of the various elements or by substituting technical equivalents, without departing from the scope of protection as defined by the following claims.

PATENTKRAV

1. Kombination af et primært redskab (1) og et sekundært redskab (4), der er beregnet til at blive hægtet på det primære redskab (1) ved hjælp af to forbindelsesanordninger (8a, 8b), hvor hver forbindelsesanordning (8a, 8b) omfatter en krog (10a, 10b) og en tap (11a, 11b) beregnet til at blive indsat i den tilsvarende krog (10a, 10b), den ene af krogene (10a, 10b) er en forreste krog (10a) og den anden er en bagerste krog (10b) under hensyntagen til køreretningen, **kendetegnet ved, at** den forreste krog (10a) har en bagudrettet åbning og udgør en tilnærmelsesvis horisontal positioneringsrampe (9), og at den bagerste krog (10b) har en åbning rettet på en sådan måde at det plan, der passerer gennem medianplanet (19b) af den bagerste krogs (10b) åbning skærer det plan, der passerer gennem medianplanet (19a) af den forreste krogs (10a) åbning.

2. Kombination ifølge krav 1, **kendetegnet ved, at** den ene af krogene (10a, 10b) har en U-form, positioneringsrampen (9) udgør det ene ben af U-et og åbningen er orienteret bagud.

3. Kombination ifølge krav 1 eller 2, **kendetegnet ved, at** orienteringen af krogenes (10a, 10b) åbninger er sådan, at den rette gennemskæringslinje forløber i kombinationens byggehøjde.

4. Kombination ifølge et hvilket som helst af kravene 1-3, **kendetegnet ved, at** den forreste krog (10a) og den bagerste krog (10b) forløber i samme vertikale plan parallelt med køreretningen (A).

5. Kombination ifølge et hvilket som helst af kravene 1-4, **kendetegnet ved, at** mindst en af krogene (10a, 10b) låses automatisk, når tappen (11a, 11b) indsættes i den tilsvarende krog (10a, 10b).

6. Kombination ifølge et hvilket som helst af kravene 1-5, **kendetegnet ved, at** en styrerampe (15) forlænger positioneringsrampen (9).

7. Kombination ifølge krav 6, **kendetegnet ved, at** styrerampen (15) er tilnærmelsesvis horisontal eller skrånende.

8. Kombination ifølge krav 6, **kendetegnet ved, at** styrerampen (15) er tilnærmelsesvis buet.

9. Fremgangsmåde til ophængning af det sekundære redskab (4) på det primære redskab (1) ifølge krav 1, **kendetegnet ved, at** ophængningen udføres i flere trin:
- det første trin består i at tilkoble det primære redskab (1) til traktoren (3);
- det andet trin består i, i bakgear i retningen (B), at udføre en opstilling i lige linje i den tværgående retning til retningen (B) af det primære redskab (1) i forhold til det sekundære redskab (4) samt en opstilling i lige linje for at bringe den forreste tap (11a) i indgreb med den forreste krog (10a),
- det tredje trin består i at løfte det primære redskab (1) for at den bagerste tap (11b) får plads i den bagerste krog (10b), og
- det fjerde trin består i at låse den bagerste krog (10b).

10. Fremgangsmåde til ophængning ifølge krav 9, **kendetegnet ved, at** den forreste krog (10a) låses inden udførelse af det tredje trin.

FIG. 1

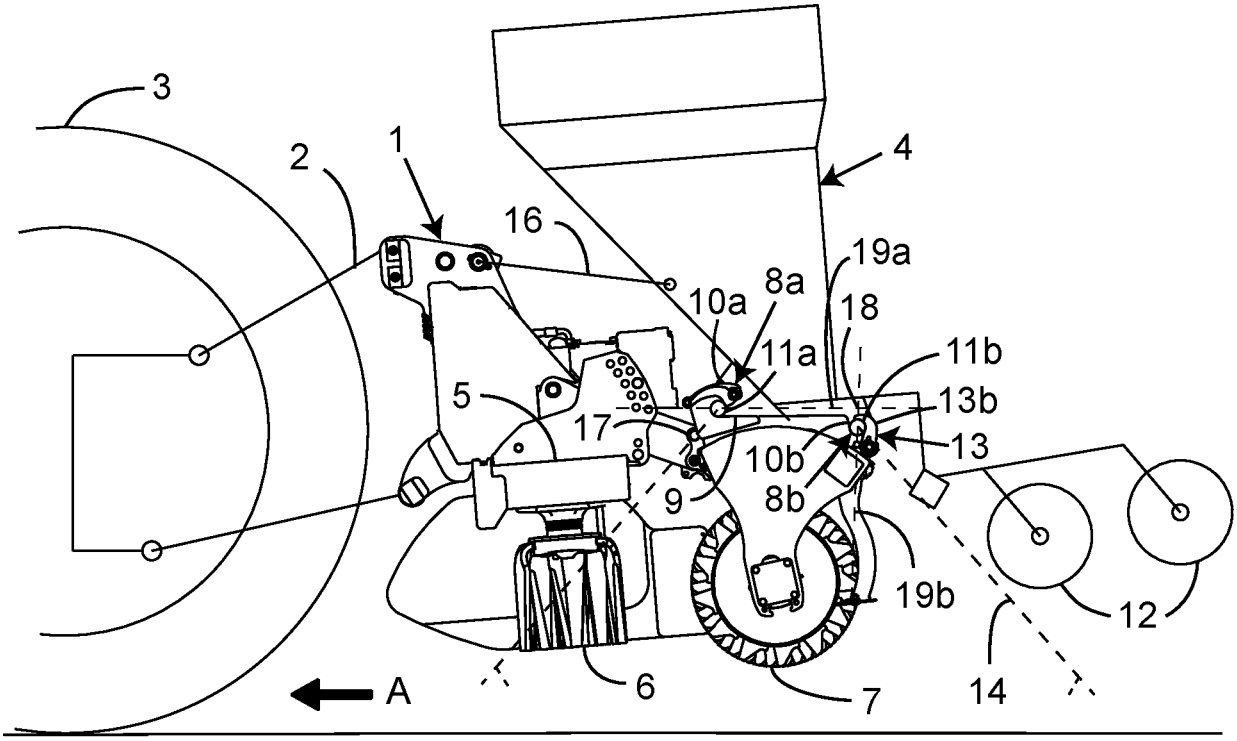

3
2
1
4
16
19a
10a
8a
18
11a
11b
5
13b
17
13
10b
9
8b
19b
12
A
6
7
14

FIG. 2

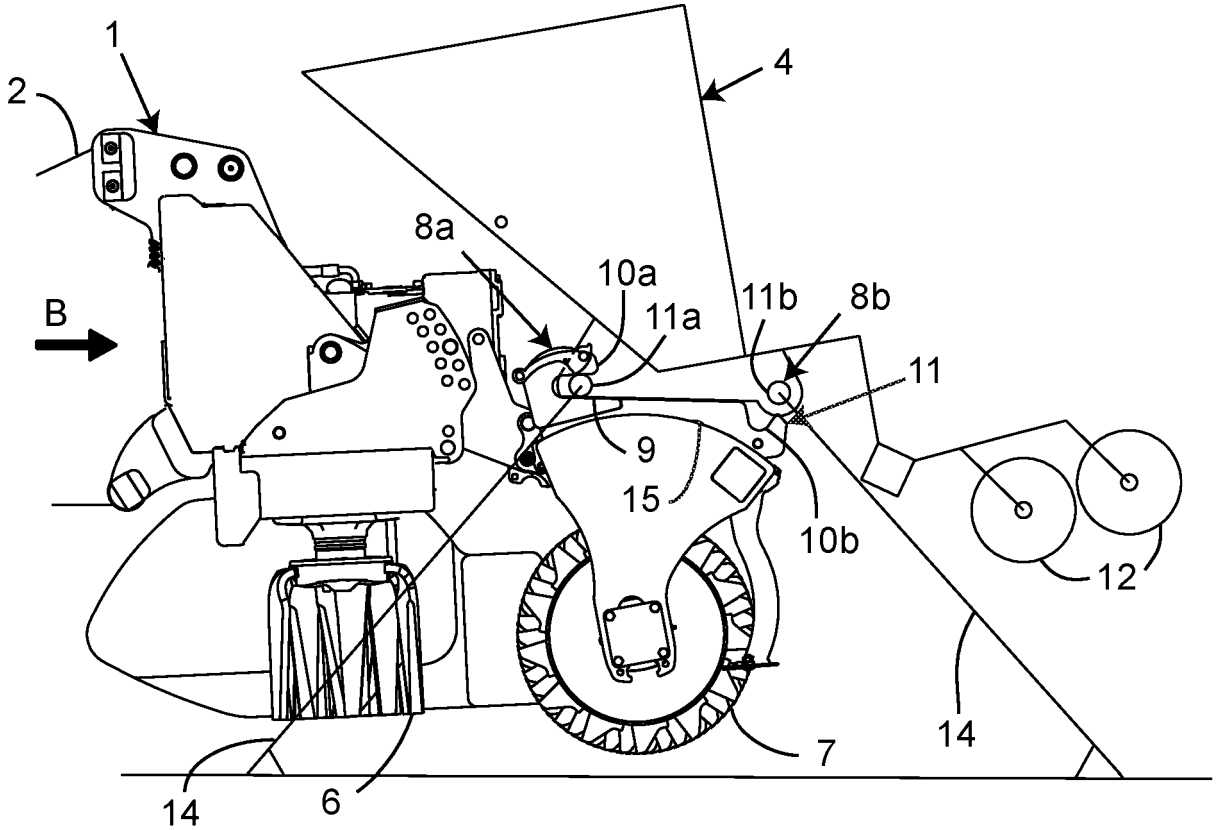

1
2
4
8a
10a
11a
11b
8b
B
11
9
15
10b
12
14
7
14
6

FIG. 3

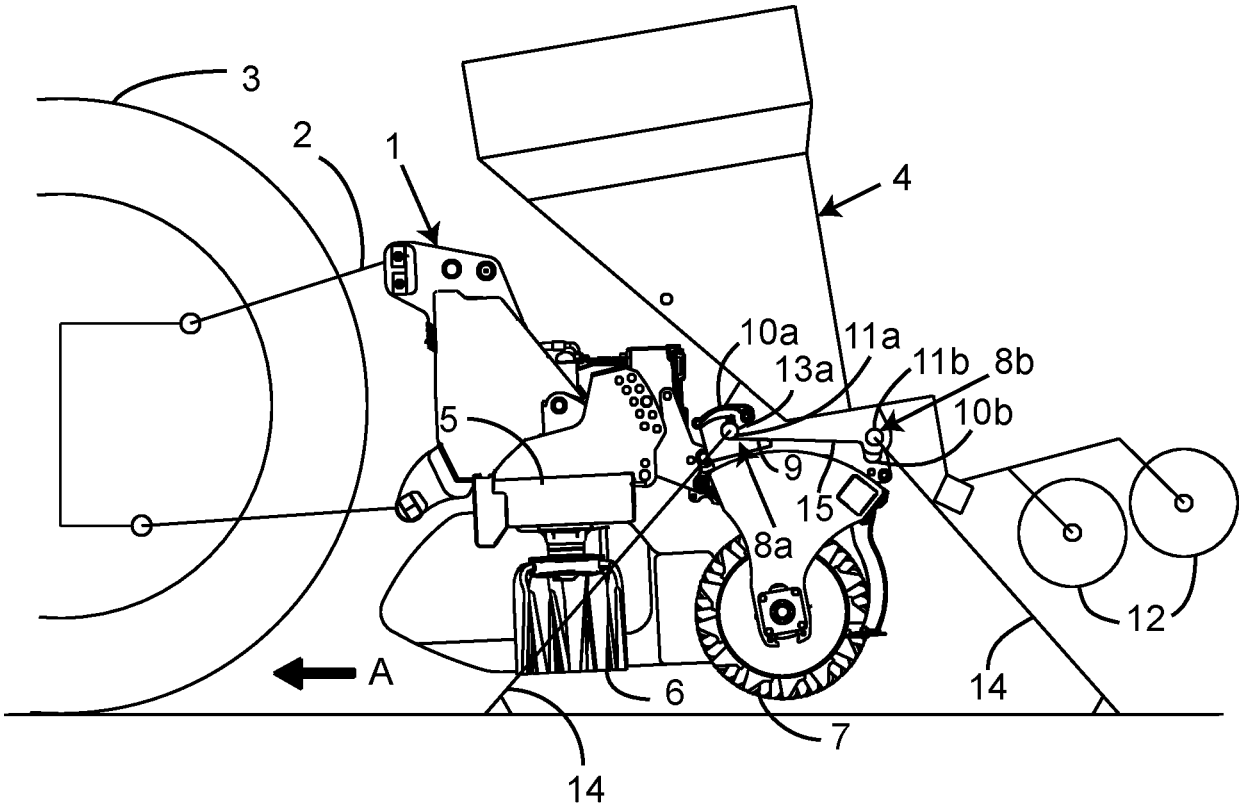
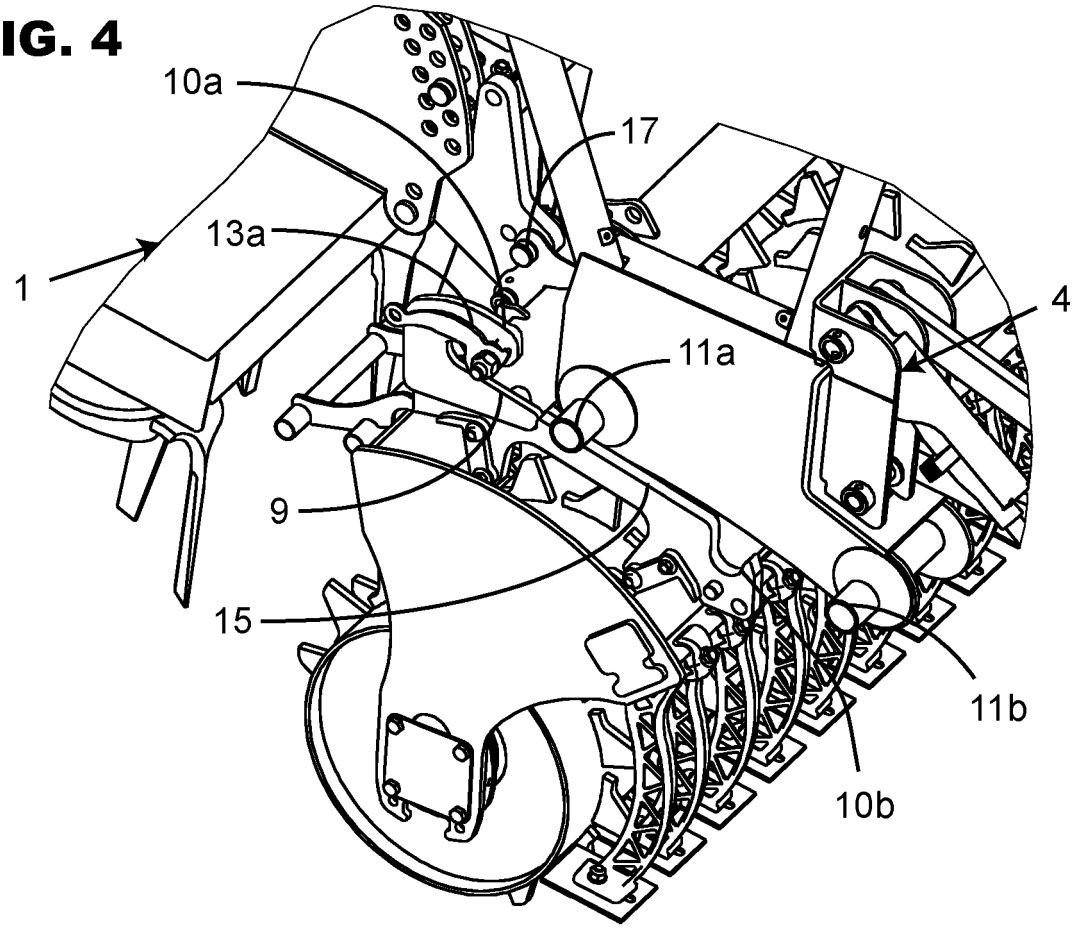

3
2
1
4
10a
11a
13a
11b
8b
10b
5
9
15
8a
12
A
6
14
7
14

FIG. 4


10a
17
13a
1
4
11a
9
15
11b
10b