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Octrooihouder(s):
Forage Innovations B.V. te Maassluis.

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Uitvinder(s):
Bart van der Lelij te Maassluis.

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ir. M.J.F.M. Corten te Maassluis.

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An agricultural machine for working grass, hay or other crops, as well as a raking member.

(57)

An agricultural machine for working grass, hay or other crops on the field, comprises a frame, a rake member arm mounted on the frame, and a rake member. The rake member comprises a centre body rotatably mounted on the rake member arm, at least one rake element arm extending from the centre body, and one or more rake elements mounted on the rake element arm. The rake element arm comprises a first arm part and a second arm part, which are pivotally connected to each other between a working position and a transport position. The rake member comprises a locking device for locking the first arm part with respect to the second arm part. The locking device comprises a locking pin movably mounted on the first arm part between a locking position and a releasing position. The locking device comprises a first slot and second slot which are mounted on the second arm part. The first slot is arranged to receive the locking pin in the locking position when the first arm part and the second arm part are positioned in the working position to lock the first arm part with respect to the second arm part in the working position. The second slot is arranged to receive the locking pin in the locking position when the first arm part and the second arm part are positioned in the transport position to lock the first arm part with respect to the second arm part in the transport position.

An agricultural machine for working grass, hay or other crops, as well as a raking member

5 The present invention relates to an agricultural machine for working grass, hay or other crops on the field.

EP 1 362 505 A1 discloses a machine for working grass, hay or other crops. This machine comprises a frame that can be pulled by a pulling vehicle, for example a tractor. On the frame, one end of a rake member arm is mounted. The other end of the rake member arm supports a rake member. The rake member comprises a
10 centre body, rotatably mounted on the rake member arm, a plurality of rake element arms extending from the centre body, and one or more rake elements mounted on each rake element arm. The rake member arm is movable between a transport position in which the rake element arm extends in a substantially vertical plane and a working position in which the rake element arm extends in a substantially horizontal plane. In the
15 transport position, the upper rake elements tend to be too high. Therefore, some of the rake element arms are provided with a hinge that allows an outer arm part of the rake element arm to hinge about the outer end of an inner arm part so as to reduce the length of the rake arm for transport.

To lock the inner arm part and the outer part in the working position, a
20 separate pin is provided that can be arranged in holes provided on the inner arm part and the outer arm part. When the inner arm part and outer arm part are arranged in the working position, these holes are aligned to allow the pin to be inserted in the holes of both the inner arm part and the outer arm part. When it is desired to arrange the rake element arm in the transport position, the separate pin must be taken out of the aligned
25 holes of the inner arm part and the outer arm part, to allow a folding movement of the outer part arm to the transport position. A drawback of the machine of EP 1 362 505 A1 is that the separate pin is easily lost.

An object of the invention is to provide an improved agricultural machine, which in particular provides a more user-friendly and/or reliable locking device to lock
30 the inner and outer arm part of a foldable rake element arm.

This object is achieved according to the invention by an agricultural machine for working grass, hay or other crops, comprising:

- a frame,
- a rake member arm mounted on the frame,
- 35 a rake member, the rake member comprising:

- a centre body, rotatably mounted on the rake member arm,
- at least one rake element arm extending from the centre body, and
- one or more rake elements mounted on the rake element arm,

wherein the rake element arm comprises a first arm part and a second arm part, which are hingeably connected to each other between a working position and a transport position, and

wherein the rake member comprises a locking device adapted for locking the first arm part with respect to the second arm part in the working position, and

wherein the locking device comprises:

10 a locking pin movably mounted on the first arm part between a locking position and a non-locking or releasing position,

a first slot and second slot which are mounted on the second arm part, wherein the first slot is arranged to receive the locking pin in its locking position when the first arm part and the second arm part are positioned in the working position to lock the first arm part with respect to the second arm part in the working position, and wherein the second slot is arranged to receive the locking pin in its locking position when the first arm part and the second arm part are positioned in the transport position to lock the first arm part with respect to the second arm part in the transport position.

The machine according to the invention comprises at least one rake member, for example one or two or more rake members. Each rake member is carried by a respective rake member arm. The rake member may be a raking rotor. The rake member comprises a plurality of rake element arms, which may also be referred to as tine arms. At least one of the rake element arms has a first arm part and a second arm part that are hingeably connected to each other about a hinge axis between a working position and a transport position. For example, the first arm part is an inner arm part connected to the rotating centre body, and the second arm part is an outer arm part, wherein the one or more rake elements, for example tines, are mounted on the outer arm part.

The locking device is configured to lock the first arm part and the second arm part with respect to each other in a working position and in a transport position. In the working position of the first and second arm parts, the first and second arm parts are substantially aligned with respect to each other, in particular the longitudinal axes of the first and second arm parts substantially coincide. In the transport position of the first and second arm parts, the first and second arm parts are at least partially folded with

respect to each other, in particular the second arm part is hinged with respect to the first arm part so as to reduce the length of the rake element arm.

The locking device comprises a locking pin that is movably mounted on the first arm part. It is noted that the locking pin may directly or indirectly be mounted on the first arm part. Indirectly mounted means that the locking pin may be mounted on a part of the locking device, for example a hinge part, or another part of the machine, that in its turn is mounted on the first arm part. The locking pin is movable between a locking position and a non-locking or releasing position. The locking device also comprises a first slot and second slot mounted on the second arm part. The first slot is configured to cooperate with the locking pin to lock the first arm part with respect to the second arm part in the working position. The second slot is configured to cooperate with the locking pin to lock the first arm part with respect to the second arm part in the transport position.

With the agricultural machine according to the invention, the locking pin is mounted on the first arm part so that the locking pin cannot get lost. Furthermore, the locking pin is used to lock the first arm part and the second arm part both in the working position and the transport position. As a result, the first and second arm parts can be locked in the working position and the transport position in a reliable manner.

In a preferred embodiment according to the invention, the locking device comprises a hinge that hingeably connects the first arm part to the second arm part, wherein the hinge comprises a first hinge part mounted on the first arm part and a second hinge part mounted on the second arm part. The first arm part and the second arm part are hingeably connected to each other about a hinge axis. The hinge axis is defined by a hinge which may comprise a first hinge part mounted on the first arm part and a second hinge part mounted on the second arm part. As a result, the agricultural machine is reliable, durable and user-friendly.

In an embodiment according to the invention, the hinge comprises a hinge axis which is arranged at a distance from the end of the second arm part, wherein, as seen in the longitudinal direction of the first and second arm parts in their working position, the first slot is mounted on the second arm part at a first side of the hinge axis, and wherein the second slot is mounted on the second arm part at a second side of the hinge axis opposite to the first side. By spacing the hinge from the end of the second arm part in a direction parallel to the longitudinal axis and towards the second end of the second arm part, the first slot and the second slot can be arranged on the second arm part at opposite sides of the hinge. The first slot may, for example, be arranged between the hinge axis and the end of the second arm part located adjacent to the first arm part

and the second slot may be arranged at the other side of the hinge axis. As a result, the second arm part can be pivoted about the hinge axis between the working position, in which the first slot is aligned with the locking pin, and a transport position, in which the second slot is aligned with the locking pin. The hinge axis of the hinge may also be spaced from the end of the first arm part in a direction parallel to the longitudinal axis of the first arm part and away from the first arm part.

In an embodiment according to the invention, the first hinge part comprises a cylindrical part adapted to be mounted on the end of the first arm part, and a recessed cylindrical part adapted to receive a part of the second arm part in the working position. During use substantial forces may be exerted on the rake element arm when grass, hay or other crop is displaced on the field. Therefore, it is advantageous to be able to transfer substantial forces from the second arm part to the first arm part. By providing a first hinge part that has a cylindrical part mounted on the end of the first arm part and a recessed, for example half open, cylindrical part to receive a part of the second arm part in the working position, a relative rigid connection between the first arm part and the second arm part is formed. Such a construction may also reduce the forces exerted on the hinge.

In a preferred embodiment according to the invention, the locking pin is biased towards the locking position. The locking pin may, for example, be biased towards the locking position by a spring element. By biasing the locking pin towards the locking position, for example by using a spring element, an inadvertent release of the locking pin between the first arm part and the second arm part in either the working position or the transport position can be avoided or at least substantially be prevented. Thus, the first and second arm parts can be locked in a very reliable manner.

In an embodiment according to the invention, the locking pin is mounted in a locking pin housing. The locking pin housing is a housing that receives the locking pin, while it allows a sliding movement of the locking pin in a direction of movement parallel to its longitudinal axis, whereby the locking pin is movable between the locking position and the non-locking or releasing position. The locking pin housing may, for example, be formed by a first locking pin holder and a second locking pin holder, wherein the first and second locking pin holders have openings to receive the locking pin therein.

In a further embodiment according to the invention, the locking pin is rotatable about its longitudinal axis, wherein the locking pin comprises a cam extending at least partially transversely to the longitudinal axis of the locking pin, and wherein the locking pin housing comprises a cam surface adapted to cooperate with the cam such

that by rotation of the locking pin about its longitudinal axis the cam of the locking pin moves along the cam surface to move the locking pin from its locking position towards its non-locking or releasing position and/or from its non-locking or releasing position towards its locking position. When the locking pin has to be moved to the non-locking or releasing position, the locking pin may have to be moved against the biasing force of a spring element. To facilitate this movement of the locking pin, a cam may be provided that extends at least partially transversely to the longitudinal axis of the locking pin. The cam may be formed by a protrusion arranged on the outer cylindrical surface of the locking pin. The cam cooperates with the cam surface, for example a sloped or curved surface, provided in the locking pin housing, such that rotation of the locking pin about its longitudinal axis results in movement of the cam along the cam surface. The cam surface is shaped in such a way that movement of the cam along the cam surface, caused by rotation of the locking pin about its longitudinal axis, results in a movement of locking pin towards the non-locking or releasing position. Rotation of the locking pin in the opposite direction will result in movement of the locking pin towards the locking position.

In an embodiment according to the invention, the machine comprises two rake members, which are arranged at opposite sides of the frame. The machine according to the invention may also comprise more rake members, for example three, four, five or six rake members. In particular, each rake member is carried by a respective rake member arm. Preferably, the or each rake member arm is pivotally connected to the frame about a substantially horizontal pivot axis between a rake member working position and a rake member transport position.

It is possible according to the invention that the or each rake member comprises a plurality of rake element arms, wherein not all but only a subset of the rake element arms is foldable as described above. In this case, the above described rake element arm is of a first foldable type, wherein the rake member comprises a plurality of rake element arms of a second type different from the first foldable type, in particular non-foldable. To reduce the transport height in the transport position, it is not necessary for all rake element arms to be foldable. If, for example only 4-6 rake element arms of the or each rake member are foldable, the desired reduction in transport height can already be achieved.

The invention also relates to a rake member for working grass, hay or other crops on the field as described above.

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows a perspective view of an exemplary embodiment of a machine according to the invention; and

5 Figure 2 shows a perspective view of a locking device arranged on a rake member of the machine of Figure 1.

10 A machine for working grass, hay or other crops is generally denoted in figure 1 by reference numeral 1. In this exemplary embodiment, the machine 1 is a rotary rake. The machine 1 comprises a frame 2 having a front end 3 configured to be connected to a pulling vehicle, for example a tractor, and a rear end 4 provided with wheels 5 to support the frame 2. At each side of the frame 2, a rake member arm 6 having a fixed length is provided. A trolley carrying a rake member 7 can be displaced in a sliding manner along each rake member arm 6. However, the rake member arm 6 can be constructed in a different manner, for example as a telescopic arm.

15 Each rake member 7 comprises a centre body 8 that is rotatably connected to the trolley on the respective rake member arm 6. Multiple rake element arms or tine arms 9 are distributed about the circumference of the centre body 8 and extend from the centre body 8. At the distal ends of the rake element arms 9 rake elements 10, for example tines, are provided.

20 During use of the machine 1, when the frame 2 is pulled in a direction of travel over a field on which grass, hay or other crops are present, the rake members 7 are rotated about a substantially vertical axis of rotation of the centre body 8. As a result, the crops on the field are displaced by the rake elements 10 in order to arrange the crops in a desired configuration on the field.

25 The rake member arms 6 and the rake members 7 connected thereto are movable between a working position, in which the rake element arms 9 extend in a substantially horizontal plane (as shown in Figure 1), and a transport position in which the rake elements arm extend in a more upright plane, for example in a substantially vertical plane. Hydraulic cylinders 11 are provided to actuate the movement of the rake member arms 6 between the working position and the transport position.

30 When the machine is not used, it is desirable to bring the machine in a compact configuration. In particular for road transport, it is important that the machine does not exceed a maximum transport height. At the same time it is desirable that the working width during use, i.e. in the working position, is relatively large so that a wide
35 strip of field can be handled by the machine 1.

In order to avoid that the machine becomes too high during transport, according to the invention, at least some of the rake element arms 9 comprise an inner arm part 12 and an outer arm part 13 that are pivotally connected to each other between a working position and a transport position. In the working position, the longitudinal axes of the inner arm part 12 and the outer arm part 13 of such a foldable rake element arm 9 coincide such that the configuration of the foldable rake element arms 9 in the working position substantially corresponds to the configuration of the other non-foldable rake element arms 9.

In the transport position, the outer arm parts 13 may be arranged in a folded position with respect to the inner arm parts 12 such that the maximum radial distance of the outer arm parts 13 with respect to the axis of rotation of the centre body 13 is smaller than the maximum radial distance of the outer arm parts 13 in the working position. This results in a reduced height of the machine 1, when the rake members 7 are pivoted upwards to the transport position, and the folded outer arms 13 are arranged at the upper side of the machine 1 in this transport position. The rotated outer arm parts 13 may also result in a reduced width in transport position.

The rake element arms 9 having an inner arm part 12 and outer arm part 13 that are hingeable with respect to each other comprise a hinge 14 and a locking device. The hinge 14 and locking device are schematically indicated by boxes A in figure 1. The hinge 14 and the locking device are shown in more detail in figure 2.

In figure 2, the inner arm part 12 and the outer arm part 13 are shown in the working position. The inner arm part 12 and the outer arm part 13 are hingeable with respect to each other about a hinge 14 having a hinge axis 15. The hinge 14 is formed by a first hinge part 16 mounted on the inner arm part 12, a second hinge part 17 mounted on the outer arm part 13, and also a hinge pin 18.

The first hinge part 16 comprises a cylindrical part 19 which is mounted on the end of the inner arm part 12, and a recessed, for example half-open, cylindrical part 20 which protrudes from the end of the inner arm part 12 and configured to receive an end part of the outer arm part 13, when the outer arm part 13 is arranged in the working position. When the outer arm part 13 is received in the cylindrical part 20, forces exerted on the rake element arm may be more efficiently transferred from the outer arm part 13 onto the inner arm part 12. At the end of the first hinge part 16 remote from the end of the inner arm part 16, hinge elements are provided having openings to receive the hinge pin 18.

On the first hinge part 16, a locking pin housing 21 is mounted. The locking pin housing 21 comprises a first locking pin holder 22 and a second locking pin holder 23. Each of the first locking pin holder 22 and the second locking pin holder 23 comprises a locking pin receiving hole through which a locking pin 24 extends. The inner diameter of the locking pin receiving holes of the first and second locking pin holders 22, 23 substantially corresponds to the outer diameter of the locking pin 24 such that the locking pin 24 can slide in its longitudinal direction in the locking pin housing 21 between a locking position and a non-locking or releasing position. The direction of the sliding movement is substantially parallel to the longitudinal direction of the inner arm part 12. The locking pin 24 is biased by a coiled spring element 25 towards the locking position, e.g. in the shown embodiment towards the hinge pin 18.

On the outer arm part 13, a first slot element 26 having a first slot 27 is mounted. An opening 28 is provided in the first hinge part 16 to allow the slot element 26 through the first hinge part 16 in the position shown in figure 2. In the working position, the slot element 26 is arranged on the part of the outer arm part 13 between the hinge pin 18 and the end of the outer arm part 13 which is, in the working position, adjacent to the inner arm part 12. At the opposite side of the hinge pin 18, a second slot element 30 with a slot 31 is mounted on the outer arm part 13.

In the working position as shown in figure 2, the first slot 27 is aligned with the locking pin 24. Since the locking pin 24 is biased towards the locking position, the locking pin 24 is pushed by the spring element 25 into the first slot 27. This results in the locking pin 24 being reliably captured by the first slot 27 and, as a consequence, the inner arm part 12 and the outer arm part 13 are locked so as to remain aligned with respect to each other in the working position.

To release the locking pin 24 from the first slot 27, the locking pin 24 is moved against the biasing force of the spring element 25 towards the non-locking or releasing position, i.e. in this exemplary embodiment away from the hinge pin 18, until the locking pin 24 is no longer received in the first slot 27. To facilitate this movement of the locking pin 24 against the biasing force of the spring element 25, the locking pin 24 is provided with a cam 33 that protrudes from the circumferential outer surface of the locking pin 24, and the first locking pin holder 22 is provided with a cam surface 34.

The cam surface 34 and the cam 33 are configured in such a manner that rotation of the locking pin 24 about its longitudinal axis in the direction shown by arrow 35 will result in the cam 33 sliding along the cam surface 34 which is shaped such that

the locking pin 24 will be pushed due to the rotating movement of the locking pin 24 towards the non-locking position.

The cam surface 33 may be provided with an indent for receiving the cam 33 in the non-locking position so that the locking pin 24 can be held by the indent 33 in said position, i.e. when the locking pin 24 is accommodated in the indent it is prevented from being automatically pushed back to the locking position by the spring element 25. It is noted that such an indent is entirely optional. For example, in other embodiments, the biasing force of the spring element 25 may be insufficient to automatically push the locking pin 24 back to the locking position. It is also noted that any other device to move the locking pin 24 to the non-locking position may also be used.

When the locking pin 25 is held in the non-locking position, the outer arm part 13 can be pivoted with respect to the inner arm part 12 in the direction of the arrow 32. With this pivotal movement, the second slot 31 can be aligned with the locking pin 24. When the second slot 31 and the locking pin 24 are aligned, the locking pin 24 can be displaced back, i.e. such that the spring element 25 will move the locking pin 24 towards the locking position and therewith into the second slot 31. This results in the locking pin 24 being reliably secured inside the second slot 31 and, as a consequence, the inner arm part 12 and the outer arm part 13 are held in the transport position.

Thus, a single locking pin 24 is used to cooperate both with a first slot 27 to lock the outer arm part 13 with respect to the inner arm part 12 in the working position and with a second slot 31 to lock the outer arm part 13 with respect to the inner arm part 12 in the transport position.

The locking pin housing 21 and the locking pin 24 are designed such that the locking pin 24 can extend further towards the locking position than required to fully enter the first slot 27. This has the advantage that wear at the end of the locking pin 24 and/or wear in the first slot 27 does not result in play between the locking pin 24 and the first slot 27. Correspondingly, the locking pin housing 21 and the locking pin 24 may also be designed such that the locking pin 24 can extend further towards the locking position than required to fully enter the second slot 31 so that wear at the end of the locking pin 24 and/or wear in the second slot 31 does not result in play between the locking pin 24 and the second slot 31.

CONCLUSIES

1. Landbouwmachine (1) voor het bewerken van gras, hooi of ander gewas op de grond, omvattende:

5 een frame (2),

een harkorgaanarm (6) dat is aangebracht aan het frame (2),

een harkorgaan (7), waarbij het harkorgaan (7) omvat:

- een centraal lichaam (8), dat draaibaar is aangebracht aan de harkorgaanarm (6),

10 • ten minste een harkelementarm (9) die zich uitstrekt vanaf het centrale lichaam (8), en

• een of meer harkelementen (10) die zijn aangebracht aan de harkelementarm (9),

waarbij de harkelementarm (9) is voorzien van een eerste armgedeelte

15 (12) en een tweede armgedeelte (13) die onderling scharnierbaar zijn verbonden tussen een werkstand en een transportstand, en

waarbij het harkorgaan (7) is voorzien van een vergrendelinrichting die is uitgevoerd voor het vergrendelen van het eerste armgedeelte (12) ten opzichte van het tweede armgedeelte (13) in de werkstand,

20 **met het kenmerk**, dat

de vergrendelinrichting omvat:

een vergrendelpen (24) die beweegbaar is aangebracht aan het eerste armgedeelte (12) tussen een vergrendelpositie en een niet-vergrendel- of vrijgeefpositie, en

25 een eerste sleuf (27) en een tweede sleuf (31) die zijn aangebracht aan het tweede armgedeelte (13), waarbij de eerste sleuf (27) is uitgevoerd om de vergrendelpen (24) in de vergrendelpositie daarvan op te nemen als het eerste armgedeelte (12) en het tweede armgedeelte (13) in de werkstand zijn geplaatst voor het vergrendelen van het eerste armgedeelte (12) ten opzichte van het tweede armgedeelte (13) in de werkstand, en waarbij de tweede sleuf (31) is uitgevoerd om de vergrendelpen (24) in de vergrendelpositie daarvan op te nemen als het eerste armgedeelte (12) en het tweede armgedeelte (13) in de transportstand zijn geplaatst voor het vergrendelen van het eerste armgedeelte (12) ten opzichte van het tweede armgedeelte (13) in de transportstand.

2. Machine (1) volgens conclusie 1, waarbij de vergrendelinrichting is voorzien van een scharnier (14) dat het eerste armgedeelte (12) scharnierbaar verbindt met het tweede armgedeelte (13), waarbij het scharnier is voorzien van een eerste scharniergedeelte (16) dat is aangebracht aan het eerste armgedeelte (12) en een
5 tweede scharniergedeelte (17) dat is aangebracht aan het tweede armgedeelte (13).

3. Machine (1) volgens conclusie 2, waarbij het scharnier (14) is voorzien van een scharnierhartlijn (15) die is aangebracht op een positie op afstand van het eind van het tweede armgedeelte (13), waarbij de eerste sleuf (27) is aangebracht aan het
10 tweede armgedeelte (13) aan een eerste zijde van de scharnierhartlijn (15), en waarbij de tweede sleuf (31) is aangebracht aan het tweede armgedeelte (13) aan een tweede,, tegenover de eerste zijde liggende zijde van de scharnierhartlijn (15).

4. Machine (1) volgens conclusie 2 of 3, waarbij de vergrendelpen (24) beweegbaar is aangebracht aan het eerste scharniergedeelte (16).

5. Machine (1) volgens een van de conclusies 2-4, waarbij het eerste
15 scharniergedeelte (16) is voorzien van een cilindrisch gedeelte (19) dat is uitgevoerd om aangebracht te worden aan het eind van het eerste armgedeelte (12), en een uitgespaard cilindrisch gedeelte (20) dat is uitgevoerd om een gedeelte van het tweede armgedeelte (13) in de werkstand op te nemen.

6. Machine (1) volgens een van de conclusies 1-5, waarbij de vergrendelpen
20 (24) is voorgespannen naar de vergrendelpositie.

7. Machine (1) volgens conclusie 6, waarbij de vergrendelpen (24) is voorgespannen naar de vergrendelpositie door een veerelement (25).

8. Machine (1) volgens een van de conclusie 1-7, waarbij de vergrendelpen (24) beweegbaar is ten opzichte van het eerste armgedeelte (12) in een richting die in
25 hoofdzaak evenwijdig aan een langsrichting van het eerste armgedeelte (12) verloopt.

9. Machine (1) volgens een van de conclusies 1-8, waarbij de vergrendelinrichting is voorzien van een vergrendelpenbehuizing (21) die is uitgevoerd voor het opnemen van de vergrendelpen (24).

10. Machine (1) volgens een van de conclusies 1-9, waarbij de vergrendelpen
30 (24) draaibaar is om de langshartlijn daarvan, waarbij de vergrendelpen (24) is voorzien van een nok (33) die zich ten minste gedeeltelijk dwars ten opzichte van de langshartlijn van de vergrendelpen (24) uitstrekt en waarbij de vergrendelpenbehuizing (21) is voorzien van een nokoppervlak (34) dat is uitgevoerd om samen te werken met de nok (33) zodanig dat door rotatie van de vergrendelpen (24) om de langshartlijn daarvan de
35 nok (33) langs het nokoppervlak (34) beweegt om de vergrendelpen (24) vanuit de

vergrendelpositie daarvan naar de niet-vergrendelpositie en/of vanuit de niet-vergrendelpositie naar de vergrendelpositie te verplaatsen.

11. Machine (1) volgens conclusie 10, waarbij de vergrendelpenbehuizing (21) is voorzien van twee vergrendelpenhouders (22, 23), die zich op afstand van elkaar bevinden, waarbij elke vergrendelpenhouder (22, 23) een vergrendelpen opnemend gat heeft met een binnendiameter die in hoofdzaak overeenkomt met een buitendiameter van de vergrendelpen (24), waarbij ten minste een van de vergrendelpenhouders (22, 23) is voorzien van het nokoppervlak (34).

12. Machine (1) volgens een van de conclusies 1-11, waarbij het eerste armgedeelte (12) een binnenarmgedeelte is dat is verbonden met het centrale lichaam (8), en waarbij het tweede armgedeelte (13) een buitenarmgedeelte is, waarbij de een of meer harkelementen (10) zijn aangebracht aan het buitenste armgedeelte.

13. Machine (1) volgens een van de voorgaande conclusies, waarbij de machine twee harkorganen (7) omvat, die zijn aangebracht aan weerszijden van het frame (2).

14. Machine volgens een van de voorgaande conclusies, waarbij de harkorgaanarm (6) scharnierbaar is verbonden met het frame (2) om een in hoofdzaak horizontale scharnierhartlijn tussen een harkorgaanwerkstand en een harkorgaantransportstand.

15. Machine volgens een van de conclusies 1-14, waarbij de harkelementarm (9) van een eerste soort is, en waarbij het harkorgaan (7) is voorzien van meerdere harkelementarmen (9) van een tweede soort, waarbij bij voorkeur de harkelementarmen (9) van de tweede soort niet opvouwbaar zijn.

16. Harkorgaan (7) voor het bewerken van gras, hooi of ander gewas op de grond, omvattende:

een centraal lichaam (8),

ten minste een harkelementarm (9) die zich uitstrekt vanaf het centrale lichaam (8), en

een of meer harkelementen (10) die zijn aangebracht aan de harkelementarm

(9),

waarbij het harkelementarm (9) is voorzien van een eerste armgedeelte (12) en een tweede armgedeelte (13) die onderling scharnierbaar zijn verbonden tussen een werkstand en een transportstand, en

waarbij het harkorgaan (7) is voorzien van een vergrendelinrichting die is uitgevoerd voor het vergrendelen van het eerste armgedeelte (12) ten opzichte van het tweede armgedeelte (13) in de werkstand,

met het kenmerk, dat

5 de vergrendelinrichting omvat:

een vergrendelpen (24) die beweegbaar is aangebracht aan het eerste armgedeelte (12) tussen een vergrendelpositie en een niet-vergrendel- of vrijgeefpositie, en

10 een eerste sleuf (27) en een tweede sleuf (31) die zijn aangebracht aan het tweede armgedeelte (13), en waarbij de eerste sleuf (27) is uitgevoerd om de vergrendelpen (24) in de vergrendelpositie op te nemen als het eerste armgedeelte (12) en het tweede armgedeelte (13) in de werkstand zijn geplaatst voor het vergrendelen van het eerste armgedeelte (12) ten opzichte van het tweede armgedeelte (13) in de werkstand, en waarbij de tweede sleuf (31) is uitgevoerd om de vergrendelpen (24) in
15 de vergrendelpositie op te nemen als het eerste armgedeelte (12) en het tweede armgedeelte (13) in de transportstand zijn geplaatst voor het vergrendelen van het eerste armgedeelte (12) ten opzichte van het tweede armgedeelte (13) in de transportstand.

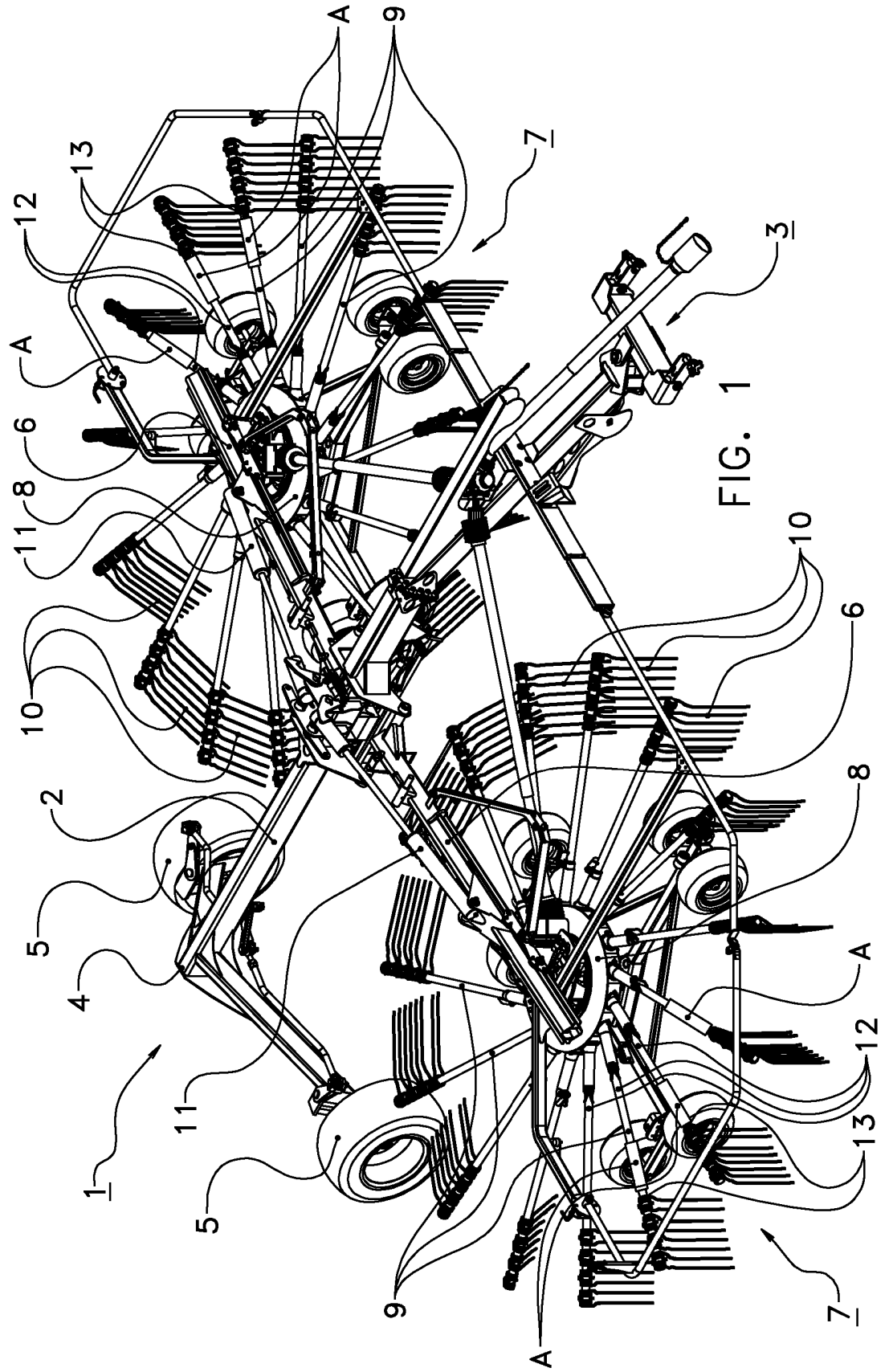


FIG. 1

ABSTRACT

An agricultural machine for working grass, hay or other crops on the field, comprises a frame, a rake member arm mounted on the frame, and a rake member. The rake member comprises a centre body rotatably mounted on the rake member arm, at least one rake element arm extending from the centre body, and one or more rake elements mounted on the rake element arm. The rake element arm comprises a first arm part and a second arm part, which are pivotally connected to each other between a working position and a transport position. The rake member comprises a locking device for locking the first arm part with respect to the second arm part. The locking device comprises a locking pin movably mounted on the first arm part between a locking position and a releasing position. The locking device comprises a first slot and second slot which are mounted on the second arm part. The first slot is arranged to receive the locking pin in the locking position when the first arm part and the second arm part are positioned in the working position to lock the first arm part with respect to the second arm part in the working position. The second slot is arranged to receive the locking pin in the locking position when the first arm part and the second arm part are positioned in the transport position to lock the first arm part with respect to the second arm part in the transport position.

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE 	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE D4827/NLP	
Nederlands aanvraag nr. 2015036	Indieningsdatum 26-06-2015	
	Ingeroepen voorrangsdatum 	
Aanvrager (Naam) Forage Innovations B.V.		
Datum van het verzoek voor een onderzoek van internationaal type 15-08-2015	Door de instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr. SN 64717	
I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven) Volgens de internationale classificatie (IPC) A01D78/10		
II. ONDERZOChte GEBIEDEN VAN DE TECHNIEK Onderzochte minimumdocumentatie		
Classificatiesysteem IPC	Classificatiesymbolen A01D	
Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen 		
III.	☐	GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES (opmerkingen op aanvullingsblad)
IV.	☐	GEBREK AAN EENHEID VAN UITVINDING (opmerkingen op aanvullingsblad)

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2015036

A. CLASSIFICATIE VAN HET ONDERWERP
INV. A01078/10
ADD.

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHE TE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimum documentatie (klassificatie gevolgd door classificatiesymbolen)

A01D

Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)

EPO-Internal, WPI Data

C. VAN BELANG GEACHTE DOCUMENTEN

Categorie *	Gesleekte documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
A	GB 1 189 224 A (LELY NV C VAN DER [NL]) 22 april 1970 (1970-04-22) * bladzijde 2, regel 54 - bladzijde 3, regel 17 * * figuren 1, 2 *	1,12,13, 15,16
A	FR 2 043 606 A1 (POETTINGER OHG ALOIS) 19 februari 1971 (1971-02-19) * bladzijde 5, regel 9 - regel 31 * * figuren 5, 7 *	1,16
A	DE 19 07 226 U (BAUTZ GMBH JOSEF [DE]) 23 december 1964 (1964-12-23) * bladzijde 2 * * figuren 1, 2 *	1,2,12, 13,15,16
	----- -/-	



Verdere documenten worden vermeld in het vervolg van vak C.



Leden van dezelfde octroofamilie zijn vermeld in een bijlage

* Speciale categorieën van aangehaalde documenten

"A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

"C" in de octrooiaanvraag vermeld

"E" eerdere octrooi(aanvraag), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

"L" om andere redenen vermaakte literatuur

"O" niet-schriftelijke stand van de techniek

"P" tussen de voorafgedatum en de indieningsdatum gepubliceerde literatuur

"T" na de indieningsdatum of de voorafgedatum gepubliceerde literatuur die niet bezwaarlijk is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

"Y" de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere gesleekte literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

"Z" lid van dezelfde octroofamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid

8 maart 2016

Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type

Naam en adres van de instantie

European Patent Office, P.O. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

De bevoegde ambtenaar

Baltanás y Jorge, R

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2015036

C (Verzoek) VAN BELANG GEACHTE DOCUMENTEN

Categorie *	Gekeerde documenten, eventueel met aanduiding van specifiek van belang zijnde passages	Van belang voor conclusie nr.
A.D	EP 1 362 505 A1 (Krone Bernhard GmbH Maschf [DE]) 19 november 2003 (2003-11-19) in de aanvraag genoemd * alinea [0011] - alinea [0013] * * alinea [0015] * * figuren 2-4 *	1,12,15, 16

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**
informatie over leden van dezelfde oestroefamilie

Nummer van het verzoek om een onderzoek naar
de stand van de techniek
NL 2015036

In het rapport genoemd oestroegeschrift	Datum van publicatie	Overeenkomstig(e) geschrift(en)	Datum van publicatie
GB 1189224	A	22-04-1970	AT 294481 B 25-11-1971
		SE 701840 A 02-01-1968	
		CH 466626 A 15-12-1968	
		DE 1582300 A1 27-08-1970	
		DE 1782954 C2 27-10-1983	
		DE 6610187 U 30-05-1973	
		GB 1189224 A 22-04-1970	
		NL 6610784 A 02-02-1968	
FR 2043606	A1	19-02-1971	AT 298135 B 25-04-1972
		CH 507634 A 31-05-1971	
		DE 2024167 A1 26-11-1970	
		DE 7018452 U 07-08-1975	
		FR 2043606 A1 19-02-1971	
DE 1907226	U	23-12-1964	GEEN
EP 1362505	A1	19-11-2003	DE 20207643 U1 22-08-2002
		EP 1362505 A1 19-11-2003	

WRITTEN OPINION

File No. SN64717	Filing date (day/month/year) 26.06.2015	Priority date (day/month/year)	Application No. NL2015036
International Patent Classification (IPC) INV. A01D78/10			
Applicant Forage Innovations B.V.			

This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the application
- ☒ Box No. VIII Certain observations on the application

	Examiner Baltanás y Jorge, R
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WRITTEN OPINION

Application number
NL2015036

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ on paper
 - ☐ in electronic form
 - c. time of filing/furnishing:
 - ☐ contained in the application as filed.
 - ☐ filed together with the application in electronic form.
 - ☐ furnished subsequently for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes: Claims	1-16
	No: Claims	
Inventive step	Yes: Claims	1-16
	No: Claims	
Industrial applicability	Yes: Claims	1-16
	No: Claims	

2. Citations and explanations

see separate sheet

WRITTEN OPINION

Application number
NL2015036

Box No. VII Certain defects in the application

see separate sheet

Box No. VIII Certain observations on the application

see separate sheet

Item V

Reference is made to the following documents:

- D1 GB 1 189 224 A (LELY NV C VAN DER [NL]) 22 april 1970 (1970-04-22)
- D2 FR 2 043 606 A1 (POETTINGER OHG ALOIS) 19 februari 1971 (1971-02-19)
- D3 DE 19 07 226 U (BAUTZ GMBH JOSEF [DE]) 23 december 1964 (1964-12-23)
- D4 EP 1 362 505 A1 (KRONE BERNHARD GMBH MASCHF [DE]) 19 november 2003 (2003-11-19) in de aanvraag genoemd

- 1 Document D1 discloses an agricultural machine for handling of grass comprising a frame (see figure 1), a rake member arm (1) carried by the frame, and a rake member (6, 7) comprising: a centre body (2, 3) rotatably connected to the rake member arm (1), at least one rake element arm (21, 27, 28) extending from the centre body (2, 3), and one or more rake elements (20) connected to the rake element arm (21, 28, 28), wherein the rake element arm (21, 27, 28) is provided with a first arm part (21) and a second arm part (27, 28) pivotally connected to each other between a working position and a transport position, and wherein the rake member (6, 7) is provided with a locking device (29, 30) for locking the first part (21) with regard to the second part (27, 28) in the working position, said locking device (29, 30) comprising a locking pin (29) and first and second holes (30) arranged on the second part (27, 28) for locking said first (21) and second (27, 28) parts in the working or transport positions.

Claim 1 differs from D1 in that the locking pin is movably mounted on the first arm between a locking position and a non-locking or releasing position, and in that the second part comprises first and second slots into which the locking pin can be received when in its locking position.

Claim 1 is therefore novel.

The technical effect of the differentiating features is that the locking pin remains connected to the first part while moving from a locking position to a release position.

The objective technical problem solved by the invention can therefore be defined as avoiding that the locking pin gets lost.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step for the following reasons: no document of the prior art discloses or suggests said non-obvious solution for solving the above mentioned problem.

More in particular, also D2, which discloses two holes on a second part (6) to receive a locking pin (11), concerns a removable locking pin, and this is again the case in document D3, wherein a removable locking pin (12) can also be received at two different holes, respectively arranged on a first part (5, 5', 5'') or on a locking plate (13).

- 2 Claims 2-15 are dependent on claim 1 and as such also meet the requirements with respect to novelty and inventive step.
- 3 Claim 16 claims a rake member comprising all the features of the rake member belonging to the subject-matter of claim 1 (see Item VIII below).

Since claim 16 differs from D1 in the same way as claim 1, claim 16 is considered to meet the requirements with respect to novelty and inventive step on same grounds as explained in point 1 above.

- 4 The industrial applicability of the invention is obvious.

Item VII

Document D1 should be identified in the description and the relevant background art disclosed therein should be briefly discussed.

Item VIII

Claim 1 claims an agricultural machine comprising a frame, a rake member arm and a rake member of a particular construction.

Claim 16 claims a rake member comprising all the features of the particular construction of the rake member belonging to the subject-matter of claim 1.

Thus, claim 1 is *de facto* dependent on claim 16, but this dependency is not explicitly acknowledged, and the numbering of the claims seems to discard it.

The inconsistency between the content of the claims and their explicit mutual relationship throws doubt on the claimed scope of protection of claims 1 and 16, thus rendering it unclear.