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(54) Title: APPARATUS AND METHOD FOR DRIVING FENCE POSTS

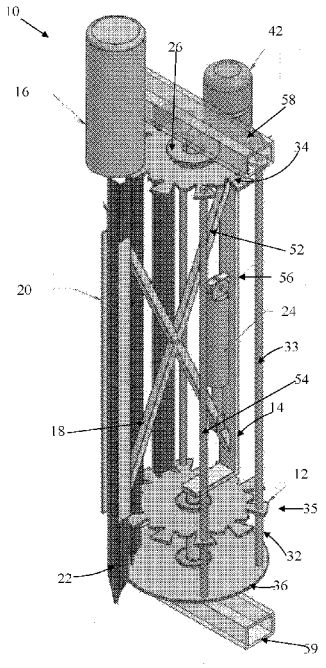

FIG.1

(57) Abstract: An apparatus (10) for driving fence posts (22) into the ground, the apparatus 10 comprises (a) a post driving unit (16) operable to drive a fence post (22) into the ground, (b) a cassette (12) for storing a plurality of fence posts (22) that is rotatable about a vertical axis to move each fence post (22) in turn to a retracted position, and (c) an assembly (14) for moving each fence post (22) in turn from the retracted position to an extended position in which the fence post (22) is aligned with the post driving unit 16 and can be driven into the ground.

APPARATUS AND METHOD FOR DRIVING FENCE POSTS

Field

The present invention relates to an apparatus and a method for driving fence posts into the ground.

Background

Well-designed and constructed fences are essential infrastructure on any property. However, the process of installing fence posts in the ground can be quite energy and time consuming.

An installer commonly sets the line where the posts need to be before digging the holes. He/she than measures and marks where the posts are going to be planted, following the spacing recommended by the manufacturer of the fence and digs the holes for the fence posts using a double ended shovel, a post hole digger or the like. One of the challenges that the installer faces is to place the posts upright in the holes and at a proper height.

This method of manually installing fence posts in the ground can be extremely time consuming particularly when dealing with large land properties.

There is a need for an alternative method for driving fence posts into the ground.

The above description is not to be taken as an admission of the common general knowledge in Australia and elsewhere.

Summary of Invention

In broad terms, the invention provides an apparatus for driving fence posts into the ground that comprises a post driving unit operable to drive a fence post into the ground, a cassette for storing a plurality of fence posts that is rotatable about a vertical axis to a predetermined position in relation to the post driving unit (described hereinafter as the "retracted position"), and an assembly for moving each fence post in turn from the predetermined position to an extended position in which the fence

post is aligned with the post driving unit and can be driven into the ground.

The present invention provides more particularly an apparatus for driving fence posts into the ground, the apparatus comprising:

a post driving unit operable to drive a fence post into the ground;

a cassette for storing a plurality of fence posts that is rotatable about a vertical axis to move each fence post in turn to a retracted position in relation to the post driving unit; and

an assembly for moving each fence post outwardly from the retracted position to an extended position in which the fence post is aligned with the post driving unit and can be driven into the ground.

In some embodiments, the assembly comprises an extendible member that is operable to move the fence post to the extended position.

The extendible member may be operable by a scissor action.

In some embodiments, the extendible member comprises a cradle for supporting the fence post in an upright position. The cradle may be in the form of a channel member that includes a web and two sides for receiving and supporting the fence post.

The cradle may further comprise magnetic elements for retaining the fence post in the cradle.

In some embodiments the assembly further comprises an actuator for moving the extendible member between the retracted position and the extended position.

The actuator may be motor driven, and can be for example a piston-cylinder assembly.

In some embodiments the cassette comprises a frame with upper and lower vertically aligned elements that are circular and have recesses for receiving and supporting the fence posts, with the recesses being formed in an outer perimeter of each element at spaced intervals around the circumference of the element.

In some embodiments the frame further comprises elongated elements interconnecting the upper and lower elements.

Each recess may include a formation, for example in the form of a centered tooth, for orienting the post in the recess.

In some embodiments the apparatus further comprises a motor operable to rotate the cassette around the vertical axis.

The present invention also provides a method for driving fence posts into the ground comprising:

- loading at least one fence post into a rotatable cassette,
- rotating the cassette about a vertical axis and moving the at least one fence post to a retracted position,
- operating an assembly to move the fence post from the retracted position to an extended position in which the fence post is aligned with a post driving unit and can be driven into the ground, and
- operating the post driving unit to drive the fence post into the ground.

In some embodiments the assembly comprises an extendible member, and the method comprises moving the extendible member and thereby moving the fence post to the extended position.

The extendible member may operate with a scissor action and may comprise a cradle for supporting the fence post in an upright position.

The cradle may be in the form of a channel member that includes a web and two sides for receiving and supporting the fence post and may comprise magnetic elements for retaining the fence post in the cradle.

In some embodiments the assembly comprises an actuator for the extendible member, and the method may further comprise operating the actuator to move the extendible member between the retracted position and the extended position.

In some embodiments the actuator is motor driven and can be, for example, a piston-cylinder assembly.

In some embodiments, the cassette comprises a frame with upper and lower vertically aligned elements that are circular and have

recesses for receiving and supporting fence posts, with the recesses being formed in an outer perimeter of each element at spaced intervals around the circumference of the element, and the method may further comprise:

receiving and supporting the fence posts in the recesses.

In some embodiments, the frame further comprises elongated elements interconnecting the upper and lower elements.

The method may further comprise orienting the post in the recess via a formation, for example in the form of a centered tooth, formed in each recess.

The method may further comprise operating a motor to rotate the cassette around the vertical axis.

Brief description of the drawings

In order that the invention may be more clearly ascertained, embodiments of the invention are now described, by way of example, with reference to the accompanying drawing, in which:

Figure 1 is a perspective view of the apparatus according to an embodiment of the invention;

Figure 2A is a side elevation of the apparatus of Fig. 1 in a retracted position;

Figure 2B is a side elevation of the apparatus of Fig. 1 in an extended position;

Figure 3 is a top plan view of the apparatus of Fig. 2B along section A-A.

Detailed description

Referring to Figure 1, the apparatus 10 for driving fence posts 22 into the ground includes a cassette 12 for storing a plurality of fence posts 22, an assembly 14 for moving the fence posts from a retracted position to an extended position, and a post driving unit 16 for driving the fence posts into the ground.

The cassette 12 is rotatable about a vertical axis to move each fence post 22 in turn to the retracted position (shown in

Figure 2A) from which the fence post 22 can be moved to the extended position (shown in Figure 2B).

The fence posts 22 shown in the Figures are steel star posts. However, the fence posts may be made of other materials and may be formed in different shapes.

Referring to Figure 2A and 2B, the assembly 14 in the described embodiment comprises an extendible member 18 for supporting each fence post 22 when the fence post 22 is in the retracted position (Figure 2A). The extendible member 18 includes two scissor arms 52, 54 connected to form an X shape that moves in an extending and retracting scissor action. The two scissor arms 52, 54 are connected at one end to a vertical support member 56 and at the opposite end to a cradle 20. The cradle 20 is moved by the action of the extendible member 18 to contact the fence posts 22 and move them out of the frame 32 underneath the post driving unit 16 which drives the fence posts 22 into the ground (Figure 2B).

The extendible member 18 is positioned within the frame 32 of the cassette 12 so that in the retracted position the rotational movement of the cassette 12 is not impeded. In the described embodiment the vertical support member 56, which forms the central portion of the extendible member 18, is a 40 by 8 millimeters flat bar and is set back 90 millimeters from the center of the cassette 12 to make space for the extending central scissor arms 52, 54 to fold inside the frame 32.

The cradle 20, positioned at the opposite end to the vertical support member, engages the fence post 22 and supports it in an upright position. The cradle 20 in the described embodiments is in the form of a channel member that includes a web and two sides for receiving and supporting the fence post.

The cradle 20 may comprise magnetic elements for retaining the fence post in the cradle 20. The magnetic elements improve the contact between the extendible member 18 and the fence post 22 and more stably retain the fence post 22 in the cradle 20 when the latter is driven to the ground.

The assembly 14 is operable by an actuator 24 implemented for moving the extendible member 18 between the retracted position

(Figure 2A) and the extended position (Figure 2B). The actuator 24 is for example a piston-cylinder assembly 14, a piston hammer or the like. The actuator 24 is in this case motor driven, but can also be manually operated. In other embodiments the assembly 14 is manually operable.

The cassette 12, as shown in Figure 1, comprises a frame 32 with upper and lower vertically aligned elements 34. These elements can be described as "snowflake-like" because this is the general shape of the elements. The elements 34, 35 are circular and have recesses 38 for receiving and supporting and thereby storing the fence posts 22. The recesses 38 are formed in an outer perimeter of each element 34, 35 at spaced intervals around the circumference of the elements.

The cassette 12 also comprises a lower disc-shape element 36 for supporting the fence posts 22 stored in the cassette 12.

The elements 34, 35 and the lower disc-shape element 36 are in the form of separate circular plates. The elements 34, 35, 36 may be any suitable diameter and any suitable thickness. By way of example, the elements are 320 millimeters in diameter and 5 millimeters thick. In another, although not the only other embodiment, the elements are 240 millimeters in diameter and 5 millimeters thick.

As mentioned above, the lower disc-shape element 36 does not include recesses and serves as a supporting base for the posts. The elements 34, 35 are parallel and spaced apart above the lower disc-shape element. In the described embodiment a first element 34 is 100 millimeters above lower disc-shape element 36 and a first element 35 is 800 millimeters above the second element.

The elements 34, 35 include recesses 38 that can be formed in different shape and depth depending on the type of fence posts used. In the embodiment described in Figure 1 to 2B the cassette 12 holds the fence posts 22 inside ten evenly-spaced recesses around the circumference of the elements 34, 35. The cassette 12 can have any other suitable number of recesses to accommodate a different number of fence posts.

In the embodiment described in Figure 3 the elements 34, 35 include ten recesses 45 millimeters wide by 45 deep, evenly spaced along the external circumference the elements 34, 35.

Each recess 38 includes a formation 40, in the form of a centered tooth, for orienting the post in the recess 38. The centered tooth in the recesses 38 of the elements 34, 35 keeps the posts 22 facing in line with the extendible member 18 while allowing the fence posts 22 to be reversed if needed.

The centered tooth 40 protrudes 13 millimeters from the inner cut line of the recess and is 15 millimeters wide at the tips. Other shapes and configurations can be adopted, particularly when different fence posts are used.

The cassette's frame 32 further includes elongated elements 33 interconnecting the upper and lower elements 34, 35. These elongated members 33 connect the three elements 34, 35, 36 of the cassette 12, thereby providing a more solid structure.

The described embodiment further includes a motor 42 operable to rotate the cassette 12 around the vertical axis. However, in other embodiments the cassette 12 can be manually rotated.

Once the cassette 12 is rotated to place the fence post 22 in the retracted position, the assembly 14 can move the fence post 22 in the extended position where the post can be driven into the ground.

The cassette 12 and the vertical support member 56 of the extensible member 18 are connected to two bearings 26 mounted at top and bottom of the cassette 12. The two bearings 26 support the outer frame 32 for rotation around the vertical support member 56 while a sprocket (not shown) mounted on top of the cassette 12 is driven by an electric motor 42 that rotates the cassette 12 until another fence post is in line with the extendible member 18.

The top and the bottom bearings 26 are further connected to an upper support element 58 and a lower support element 59 respectively. The upper and lower support elements 58, 59 support the frame of the cassette 12 allowing rotation thereof. The upper and lower support 58, 59 elements also serve as attachment to a

vehicle, such as a tractor, so that the apparatus 10 for driving fence posts into the ground can be transported.

The above-described embodiment of the apparatus of the present invention can be operated by one person without the need to have assistance of another person.

In order to build a fence, an installer first loads the fence posts 22 in the cassette 12. The installer then rotates the cassette 12 about a vertical axis to position each of the fence post 22 in turn in the retracted position (shown in Fig 2A). The installer, then, either manually or electrically, actuates the assembly 14 to move the fence post 22 from the retracted position to the extended position (shown in Fig. 2B). In the extended position the fence post 22 is aligned with the post driving unit 16 which is then operated to drive the fence post 22 into the ground. The cradle 20 provides a very efficient mechanism and support to keep each fence post straight while being driven into the ground.

The installer then moves the apparatus 10 to the location for another post and repeats the above procedure.

The apparatus can be located on the back of a flat tray vehicle or on a tractor. The apparatus is relatively compact and can be mounted conveniently on these vehicles and removed and re-installed as required.

Modifications within the scope of the invention may be readily effected by those skilled in the art. It is to be understood, therefore, that this invention is not limited to the particular embodiments described by way of example hereinabove.

By way of example, whilst the embodiment of the apparatus shown in the Figures is described above as having particular dimensions for components of the apparatus, the invention is not limited to these dimensions and extends to any suitable dimensions for the components.

It is to be understood that the reference to prior art herein does not constitute an admission that such prior art forms a part of the common general knowledge in the art, in Australia or in any other country.

In the claims that follow and in the preceding description of the invention, except where the context requires otherwise due to express language or necessary implication, the word "comprise" or variations such as "comprises" or "comprising" is used in an inclusive sense, i.e. to specify the presence of the stated features but not to preclude the presence or addition of further features in various embodiments of the invention.

CLAIMS:

1. An apparatus for driving fence posts into the ground, the apparatus comprising:

a post driving unit operable to drive a fence post into the ground;

a cassette for storing a plurality of fence posts that is rotatable about a vertical axis to move each fence post in turn to a retracted position in relation to the post driving unit; and

an assembly for moving each fence post in turn outwardly from the retracted position to an extended position in which the fence post is aligned with the post driving unit and can be driven into the ground.

2. The apparatus of claim 1 wherein the assembly comprises an extendible member that is operable to move the fence post to the extended position.

3. The apparatus of claim 2 wherein the extendible member is operable by a scissor action.

4. The apparatus of claim 2 or claim 3 wherein the extendible member comprises a cradle for supporting the fence post in an upright position.

5. The apparatus of claim 4 wherein the cradle is in the form of a channel member that includes a web and two sides for receiving and supporting the fence post.

6. The apparatus of claim 4 or claim 5 wherein the cradle comprises magnetic elements for retaining the fence post in the cradle.

7. The apparatus of any one of claims 2 to 6 wherein the assembly further comprises an actuator for moving the extendible member between the retracted position and the extended position.

8. The apparatus of claim 7 wherein the actuator is motor driven.

9. The apparatus of claim 8 wherein the actuator is a piston-cylinder assembly.

10. The apparatus of any one of claims 1 to 9 wherein the cassette comprises a frame with upper and lower vertically aligned elements that are circular and have recesses for receiving and supporting the fence posts, with the recesses being formed in an outer perimeter of each element at spaced intervals around the circumference of the element.

11. The apparatus of claim 10 wherein the frame further comprises elongated elements interconnecting the upper and lower elements.

12. The apparatus of claim 10 or claim 11 wherein each recess includes a formation, for example in the form of a centered tooth for orienting the post in the recess.

13. The apparatus of any one of claims 1 to 12 further comprising a motor operable to rotate the cassette around the vertical axis.

14. A method for driving fence posts into the ground comprising:

- loading at least one fence post into a rotatable cassette,
- rotating the cassette about a vertical axis and moving the at least one fence post to a retracted position,
- operating an assembly to move the fence post from the retracted position to an extended position in which the fence post is aligned with a post driving unit and can be driven into the ground, and

- operating the post driving unit to drive the fence post into the ground.

15. The method of claim 14 wherein the assembly comprises an extendible member, and the method comprises moving the extendible member and thereby moving the fence post to the extended position.

16. The method of claim 15 wherein the extendible member operates with a scissor action.

17. The method of claim 15 or claim 16 wherein the extendible member comprises a cradle for supporting the fence post in an upright position.

18. The method of claim 17 wherein the cradle is in the form of a channel member that includes a web and two sides for receiving and supporting the fence post.

19. The method of claim 17 or claim 18 wherein the cradle comprises magnetic elements for retaining the fence post in the cradle.

20. The method of any one of claim 15 to 19 wherein the assembly comprises an actuator for the extendible member, and the method further comprising operating the actuator to move the extendible member between the retracted position and the extended position.

21. The method of claim 20 wherein the actuator is motor driven.

22. The method of claim 21 wherein the actuator is a piston-cylinder assembly.

23. The method of any one of claims 14 to 22 wherein the cassette comprises a frame with upper and lower vertically aligned elements that are circular and have recesses for receiving and supporting fence posts, with the recesses being formed in an outer perimeter of each element at spaced intervals around the circumference of the element, and the method further comprising:

receiving and supporting the fence posts in the recesses.

24. The method of claim 23 wherein the frame further comprises elongated elements interconnecting the upper and lower elements.

25. The method of claim 23 or claim 24 further comprising orienting the post in the recess via a formation, for example in the form of a centered tooth, formed in each recess.

26. The method of any one of claims 14 to 25 further comprising operating a motor to rotate the cassette around the vertical axis.

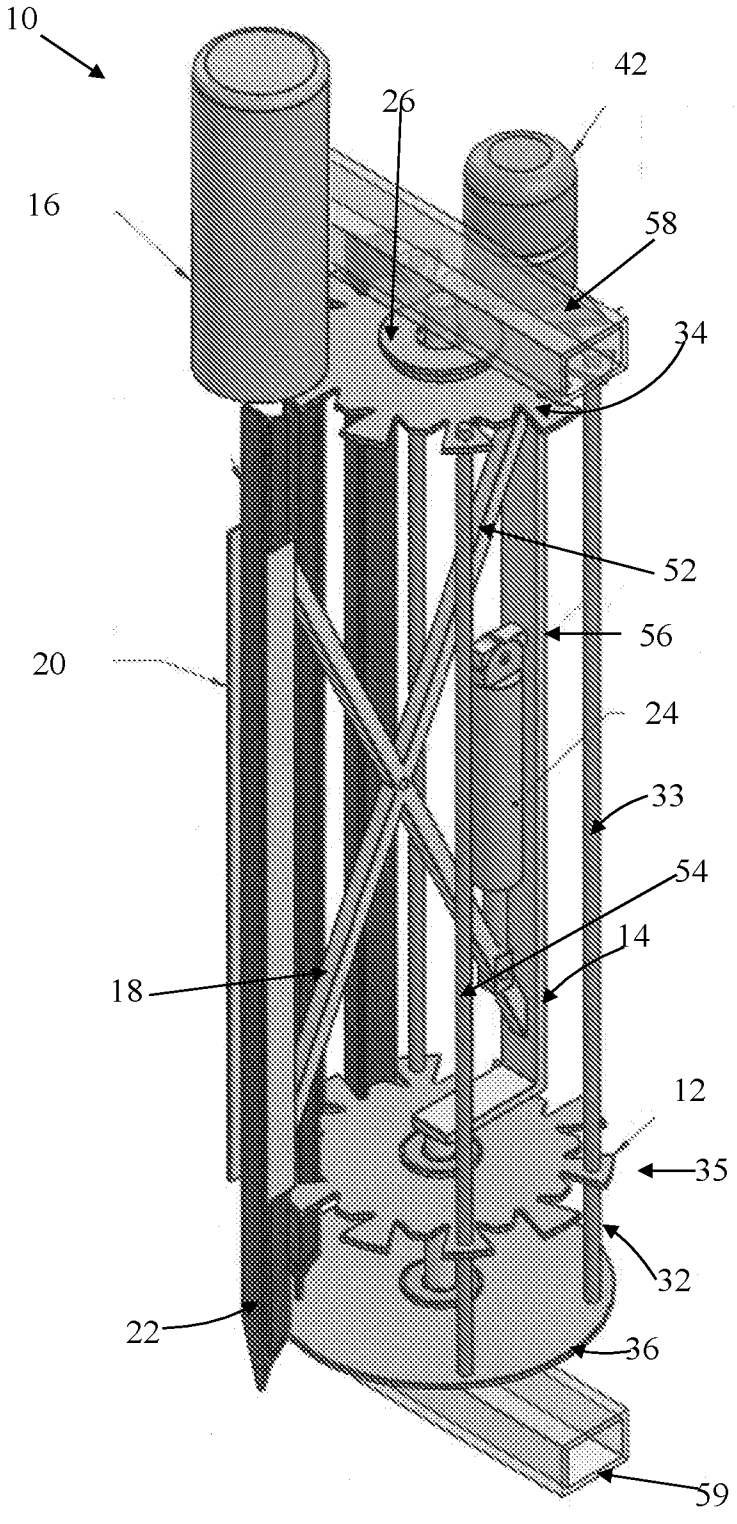

FIG.1

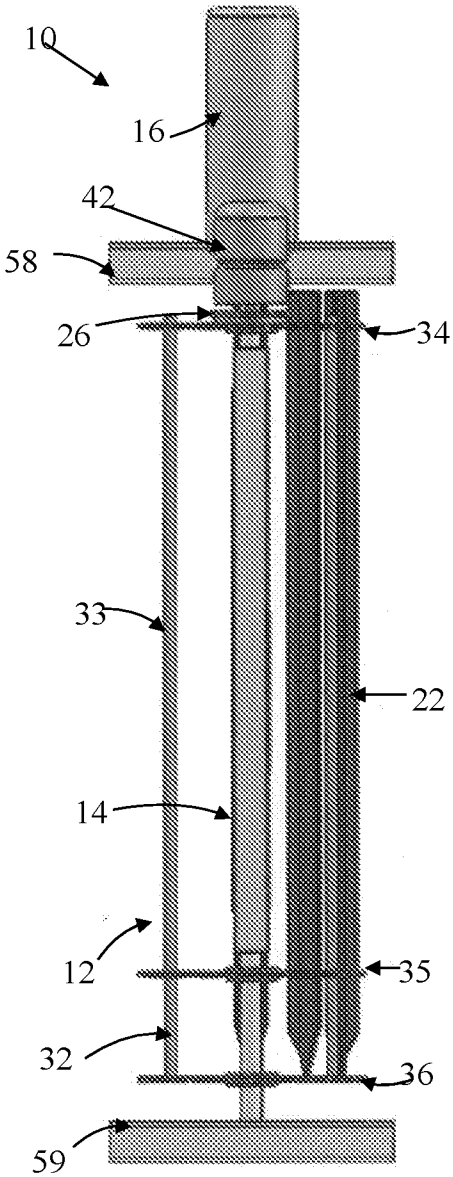

FIG. 2A

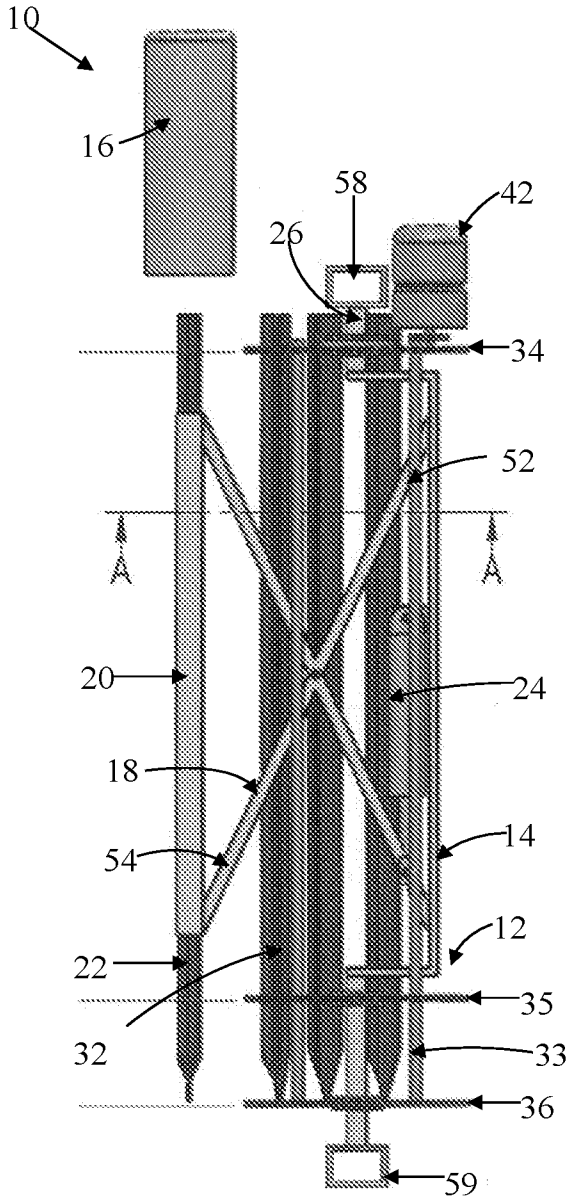

FIG.2B

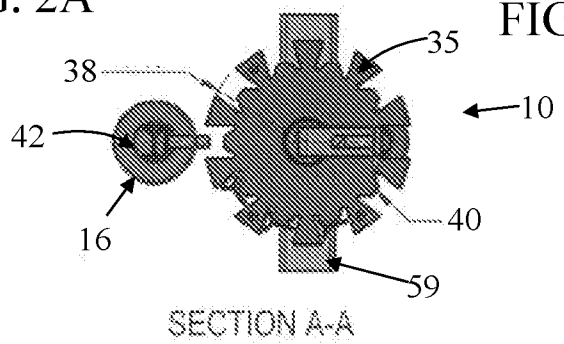

FIG.3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2018/050491

A. CLASSIFICATION OF SUBJECT MATTER

E04H 17/26 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Databases: PATENW (logical database), EPODOC, WPI, Espacenet (Worldwide), Google Search & Google Patents, AusPat and IP Australia Internal databases

IPC/CPC: E04H17/[26,263], E02D7/02, E04H12/347

Search terms: fence post, pole, stake, upright, driver, install, pile driver, rack, carousel, magazine, holder, storage, transfer, scissor, lazy tong, actuate, piston, grab, clamp, grip, magnet, and like terms.

Applicant/Inventor: MILES, David

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] Further documents are listed in the continuation of Box C [ ] See patent family annex

* Special categories of cited documents:

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search	Date of mailing of the international search report
30 July 2018	30 July 2018
Name and mailing address of the ISA/AU	**Authorised officer**
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INTERNATIONAL SEARCH REPORT		International application No.
C (Continuation).	DOCUMENTS CONSIDERED TO BE RELEVANT	**PCT/AU2018/050491**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 7004262 B1 (VOICHOSKIE et al.) 28 February 2006 Abstract; Figs. 1-14; Col. 4 - Col. 6	1-26
X	US 2776110 A (O. O. HOISTAD) 01 January 1957 Figs. 1 and 5; Col. 3	1-2, 4-5, 7, 14-15, 17-18 and 20
X	US 6591919 B1 (HERRMANN) 15 July 2003 Abstract; Figs. 1-13; Col. 3 - Col. 5	1-2, 4-5, 7-15, 17-18 and 20-26
A	US 2660035 A (J. F. ZESER) 24 November 1953	
A	US 2016/0298355 A1 (VALE S.A.) 13 October 2016	