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A Line Strainer

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ABSTRACT

A line strainer is disclosed, as well as an electric fence system and method of installation. The line strainer may include a spool having an electrically conductive axle with a first end and a second end. A securing mechanism at the first end of the axle may be configured to secure an electrically conductive link to the spool such that an electrical pathway is provided between the conductive link and the spool at the first end of the axle, the securing mechanism including a bearing member configured to act against the conductive link when secured by the securing mechanism. The bearing member may include at least one elongate recess on a surface of the bearing member facing the first end of the axle, the recess configured to receive at least a portion of the conductive link.

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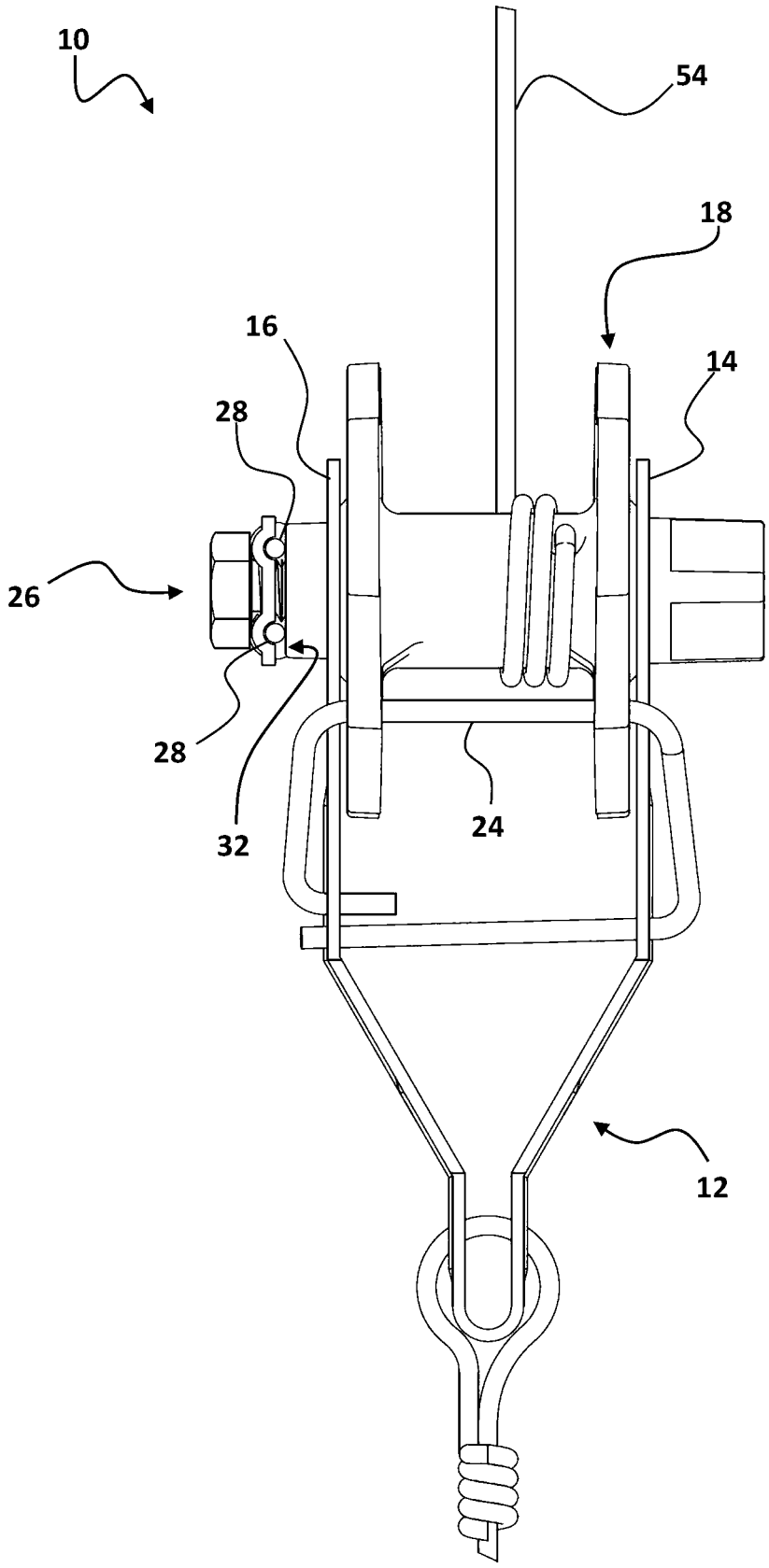
FIG. 1A



A LINE STRAINER

STATEMENT OF CORRESPONDING APPLICATIONS

This application is based on the specification filed in relation to New Zealand Patent Application No. 627387, the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

The invention relates to a line strainer for use in fencing. The line strainer may have particular application to electric fencing.

BACKGROUND

The use of electric fencing is common for a number of industries, where a current is applied to a fence line to provide an electric shock to any objects that come in contact with it. The application is especially useful for the use of controlling movement of livestock.

Typically, electric fencing is set up by having a plurality of posts along a fence line with fencing wire (reference to which should be appreciated to include conductive tape) connecting the posts. This fencing wire is secured to the posts using brackets and tensioners to keep the fence taut. The fencing wire is also conductively connected to energisers which provide the electrical current passing through the wire.

Such fences may extend in networks in the order of kilometers in length – requiring a substantial amount of labour (and therefore cost) to install and maintain. As a result, there are a wide range of products, such as connectors and brackets, available to allow the user to securely, safely, and quickly attach fencing wire and other accessories (such as energisers) to posts, fencing standards or any other object to which the fencing wire is to be secured.

In particular, wire fences typically include a number of spaced wires to create the requisite barrier. It is often desirable for more than one of these to be electrified. One method for doing so interconnects the fence wires using a vertical length of wire secured using joint clamps.

Electric fence components are exposed to all weather conditions, and the mechanical interfaces of the clamps may form an oxidizing layer which affects conductivity. The power efficiency and

effectiveness of the fence is dependent on its conductivity, and it is generally desirable to reduce the number of mechanical interfaces along the conductive path.

Further, given the labour intensive nature of installing and maintaining electric fencing networks, any improvements which lead to operational advantages such as reduction in the time and effort required to establish a robust fencing line are considered to be particularly advantageous.

It is an object of the present invention to address the foregoing problems or at least to provide the public with a useful choice.

All references, including any patents or patent applications cited in this specification are hereby incorporated by reference. No admission is made that any reference constitutes prior art. The discussion of the references states what their authors assert, and the applicants reserve the right to challenge the accuracy and pertinency of the cited documents. It will be clearly understood that, although a number of prior art publications are referred to herein, this reference does not constitute an admission that any of these documents form part of the common general knowledge in the art, in New Zealand or in any other country.

Throughout this specification, the word "comprise", or variations thereof such as "comprises" or "comprising", will be understood to imply the inclusion of a stated element, integer or step, or group of elements integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

Further aspects and advantages of the present invention will become apparent from the ensuing description which is given by way of example only.

SUMMARY

According to an exemplary embodiment there is provided a line strainer, including:

a spool having an electrically conductive axle with a first end and a second end;

a securing mechanism at the first end of the axle, configured to secure an electrically conductive link to the spool such that an electrical pathway is provided between the conductive link and the spool at the first end of the axle,

wherein the securing mechanism includes a bearing member configured to act against the conductive link when secured by the securing mechanism, the bearing member including at least

one elongate recess on a surface of the bearing member facing the first end of the axle, the recess configured to receive at least a portion of the conductive link.

According to another exemplary embodiment there is provided a method of electrically connecting a first fence line and a second fence line to each other, including the steps of:

attaching the first fence line to a first line strainer substantially as herein described;

attaching the second fence line to a second line strainer substantially as herein described; and

securing an electrically conductive link to the respective securing mechanisms of the first line strainer and the second line strainer.

According to another exemplary embodiment there is provided an electric fence system, including:

a first fence line attached to a first line strainer substantially as herein described;

a second fence line attached to a second line strainer substantially as herein described; and

an electrically conductive link secured to the respective securing mechanisms of the first line strainer and the second line strainer.

Reference to a line strainer should be understood to mean a device for connecting and tensioning a fence line. The line may be any suitable conductor known in the art for electric fencing. For example the line may be wire, and may be referred to as such herein, but it should be appreciated that this is not intended to be limiting. The line strainer may be connected between at least one wire, and another wire or a support structure such as a fence post.

The conductive link may be any suitable means known in the art for electrically interconnecting fence lines. For example, the conductive link may be a length of wire, or a strip of conductive material.

Reference to spool should be understood to mean a member configured to have material wound about it – particularly wire or conductive tape in the context of fencing. The spool may be received between the arms of a bracket, as well known in the art, within which it can rotate about its axle.

The spool may include at least one flange extending axially from the axle, having teeth around its periphery. The spool may include two such flanges spaced apart from each other along the longitudinal axis of the axle. The teeth may interact with a pawl mounted to the bracket to provide a ratchet mechanism.

In use, wire may be secured to the spool by passing through an aperture in the side of the axle, and then wound about the axle by rotation of the spool. Tension in the wire may bias the teeth against the pawl, preventing rotation of the spool in one direction unless the pawl is manually released to permit this.

It is envisaged that tension in the wire may also assist with forming a gas-tight connection between the axle and wire, reducing the likelihood of the interface becoming oxidized and thereby reducing conductivity.

Reference to a securing mechanism should be understood to be any means or mechanism known to a person skilled in the art for bearing against an object to force it against a bearing surface.

In an exemplary embodiment, the securing mechanism may threadably engage the spool. Reference to threadable engagement should be understood to mean the interaction between two parts in which at least one of the parts includes a helical thread engaging with a surface of the other. In exemplary embodiments, both parts may include complementary threads – one external and one internal – which engage with each other to prevent linear motion without application of external rotational force.

According to an exemplary embodiment the securing mechanism may threadably engage the spool at the first end of the axle, configured to secure an electrically conductive link to an electrical pathway to the spool at the first end of the axle.

In exemplary embodiments, the securing mechanism may include a threaded fastener configured to be received by a threaded aperture in the first end of the spool. This mechanism is envisaged as providing a mechanically simple means of providing sufficient bearing force to achieve a gas tight connection between the conductive link and electrical pathway to the spool, and holding the conductive link at that point.

This configuration may also assist with assembly of the strainer, in terms of positioning the spool between the arms of the bracket. The spool may include a tool engaging portion at the second end – configured to project beyond the bracket for engagement with a tool, such as a spanner, which may be used to apply rotational force to the spool to tension the wire. By reducing the length of the axle at the first end though having the securing mechanism capable of being assembled after fitting to the bracket, the arms of the bracket may not need to expand to as great an extent to accommodate the tool engaging portion.

It should be appreciated that this is not intended to be limiting, and that the securing mechanism may have other embodiments – for example a threaded projection from the first end of the axle,

onto which a threaded nut may be positioned. In another embodiment the securing mechanism may include a link aperture in the axle, intersecting with a threaded aperture, such that in use a link may be positioned in the link aperture, and secured in place using a threaded fastener bearing against it.

In an exemplary embodiment, the threaded aperture may extend only partially along the length of the axle. Line strainers are known to include an opening through the side of the axle, to permit the fence line to pass through the axle to assist with securing it in place when tensioning the line. By having the threaded aperture extend only partially along the length of the axle, the ease of threading the line though the axle may be maintained – without introducing the complicating factor of the line becoming caught on the edge of the aperture intersecting the opening through the side of the axle.

In an exemplary embodiment, the securing mechanism may be configured to secure the conductive link directly to the first end of the axle. In doing so, it is envisaged that the number of mechanical interfaces along the electrically conductive path through the strainer may be reduced – thereby reducing the likelihood of conductivity being impacted through factors such as physical separation or oxidization of such interfaces.

However, it should be appreciated that this is not intended to be limiting, and the electrical pathway may include at least one intermediary electrically conductive component – for example a washer between the axle and the conductive link.

In an exemplary embodiment, the securing mechanism includes a bearing member configured to act against the conductive link. The bearing member may include at least one elongate recess on a face of the bearing member. It is envisaged that the elongate recess may be used to locate the conductive link – both for secure connection to the electrical pathway to the spool, and also to assist in achieving a desired orientation for connection to the next fence wire.

The elongate recess may intersect the perimeter of the face of the bearing member at two points. This may assist with increasing the area of the conductive link, such as a wire, maintaining contact with the electrical pathway.

The recess may be positioned on the bearing member such that in use at least a portion of the recess always overlaps a surface of the electrical pathway to the spool – whether that be the end of the axle or an intermediary part. For example, where the bearing member is a washer on a fastener of the securing mechanism, the recess may be positioned such that at least a portion of the recess

overlaps the face of the first end of the axle regardless of lateral movement of the washer. In doing so, the conductive link may be prevented from slipping over the side of the axle.

In an exemplary embodiment the bearing member may include at least one of the elongate recesses on either side of an aperture. This may assist with interconnecting multiple conductive links – for example to fence lines above and below an intermediary line strainer. Further, in embodiments in which the recesses are achieved by press fitting a flat piece of material, corresponding protrusions may be created on the other side of the bearing element. Providing bearing surfaces on both sides of the aperture against which the securing mechanism may act may assist with distributing force across the bearing member.

In exemplary embodiments, the bearing member may rotate relative to the spool when in a non-secured state. This may enable the bearing member to be rotated in order to obtain a desired orientation for the at least one recess, once the spool has been rotated as part of tensioning the fence wire.

BRIEF DESCRIPTION OF THE DRAWINGS

Further aspects of the present invention will become apparent from the ensuing description which is given by way of example only and with reference to the accompanying drawings in which:

FIG. 1A is a top view of an exemplary line strainer according to one embodiment;

FIG. 1B is an end view of an exemplary spool of the line strainer;

FIG. 1C is a longitudinal cross-sectional view of the spool including an exemplary securing mechanism;

FIG. 1D is a magnified cross-sectional view of the securing mechanism;

FIG. 1E is a bottom view of an exemplary bearing member of the securing mechanism, and

FIG. 2 is a side view of an exemplary electric fence system.

DETAILED DESCRIPTION

FIG. 1A illustrates a line strainer (generally indicated by arrow **10**) including a body in the form of an open armed bracket **12** having a first arm **14** and a second arm **16**. A spool **18** is positioned between the first arm **14** and second arm **16**, such that the spool is able to rotate about its

longitudinal axis. The spool **18** is manufactured as a unitary part out of cast aluminium – although it should be appreciated that the spool **18** may be manufactured of any suitably conductive material known in the art.

Referring to FIG. 1B, the spool **18** includes a first flange **20a**, including a plurality of angled teeth **22**. The teeth **22** are configured to catch on a pawl **24** of the line strainer **10** – illustrated in FIG. 1A.

Returning to FIG. 1A, the line strainer **10** includes a securing mechanism **26** configured to tighten against conductive links in the form of wires **28** and **30** to bear them against a first end **32** of the spool **18**.

FIG. 1C illustrates the spool **18** and securing mechanism **26** in greater detail. The spool **18** includes an axle **34** along which the first flange **20a**, and a second flange **20b** (configured in substantially the same manner as first flange **20b**) are spaced relative to each other.

A tool engaging portion **36** is positioned at the second end of the spool **18**, distal from the securing mechanism **26**. The tool engaging portion **26** facilitates application of a tool such as a spanner (not illustrated) to the spool **18** in order to rotate it relative to the bracket **12**.

Turning to the securing mechanism **26**, area **37** shows a cross section of the spool **18**. A fastener in the form of a threaded bolt **38** is configured to tighten into threaded bore **40**. The bolt **38** acts against a bearing member in the form of a guide washer **42** to bear wire links **28** and **30** against the first end **32** of the axle **34**.

FIG. 1D shows the first end **32** of the spool **18**, in which the guide washer **42** includes a pair of elongate recesses in the form of pressed grooves **44a** and **44b** – with corresponding ridges **46a** and **46b** on the opposing side of the washer **42**.

The bolt **38** passes through a central aperture **48** of the washer **42**, with the head **50** of the bolt **38** bearing against the ridges **46a** and **46b**. Referring to FIG. 1E, the grooves **44a** and **44b** are linear, and pass on either side of the aperture **48**, intersecting the perimeter **52** of the washer **42** at two points each.

Returning to FIG. 1D, as the bolt **38** is tightened, the grooves **44a** and **44b** capture wires **28** and **30**, and urge them to bear against the first end **32** of the axle **34**. It should be appreciated that when the bolt **38** is loosened, the washer **42** (and therefore wires **28** and **30**) may be permitted to rotate about the bolt to achieve the desired orientation – for example following rotation of axle **34** to tension a fence line.

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Referring to cross-sectional area **53**, the relationship between the tolerance of the aperture **48**, width and positioning of the grooves **44a** and **44b**, diameter of the washer **42** and diameter of the first end **32** of the axle **34** is determined such that at least a portion of the grooves **44a** and **44b** overlap with the first end **32** of the axle **34**. In doing so, the wires **28** and **30** are prevented from slipping over the edge of the axle **34** during the final stages of tightening.

Returning to FIG. 1A, the securing mechanism **26** secures the wires **28** and **30** to the first end **32** to provide an electrical pathway through the spool **18** to a fence wire **54** wound about the spool **18** for tensioning.

In the embodiment illustrated, the only mechanical interfaces between the fence wire **54** and the link wires **28** and **30** is that between the fence **54** and the axle **34**, and the end **32** to the links **28** and **30**. Both the high tension achievable in wire **54** and clamping effect of the securing mechanism **26** provide gastight joints to reduce the likelihood of oxidation at these interfaces impacting conductivity (and therefore effectiveness of an electric fence system).

FIG. 2 illustrates an exemplary electric fence system **200**, including first **202a** and second **202b** line strainers configured in the manner illustrated in FIG. 1A.

The line strainers **202a** and **202b** are mounted to a post **204**, and connected to tensioned fence wires **206a** and **206b** respectively. A wire link **208** between the line strainers **202a** and **202b** creates an electrical pathway between the respective fence lines **206a** and **206b**.

An electric fence energiser **210** is electrically connected to the first line strainer **202a** by connecting cable 212, and an earth stake **214**, as known in the art. The energiser **210** is configured to output electric pulses to line strainer **202a**, which are then distributed across both fence wire **206a** and **206b**.

The entire disclosures of all applications, patents and publications cited above and below, if any, are herein incorporated by reference.

Reference to any prior art in this specification is not, and should not be taken as, an acknowledgement or any form of suggestion that that prior art forms part of the common general knowledge in the field of endeavour in any country in the world.

The invention may also be said broadly to consist in the parts, elements and features referred to or indicated in the specification of the application, individually or collectively, in any or all combinations of two or more of said parts, elements or features.

Where in the foregoing description reference has been made to integers or components having known equivalents thereof, those integers are herein incorporated as if individually set forth.

It should be noted that various changes and modifications to the presently preferred embodiments described herein will be apparent to those skilled in the art. Such changes and modifications may be made without departing from the spirit and scope of the invention and without diminishing its attendant advantages. It is therefore intended that such changes and modifications be included within the present invention.

Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope thereof as defined in the appended claims.

CLAIMS:

1. A line strainer, including:

a spool having an electrically conductive axle with a first end and a second end;

a securing mechanism at the first end of the axle, configured to secure an electrically conductive link to the spool such that an electrical pathway is provided between the conductive link and the spool at the first end of the axle,

wherein the securing mechanism includes a bearing member configured to act against the conductive link when secured by the securing mechanism, the bearing member including at least one elongate recess on a surface of the bearing member facing the first end of the axle, the recess configured to receive at least a portion of the conductive link.

2. A line strainer as claimed in claim 1, wherein the elongate recess intersects a perimeter of the surface of the bearing member facing the first end of the axle at two points.

3. A line strainer as claimed in either claim 1 or claim 2, wherein the recess is positioned on the bearing member such that in use at least a portion of the recess always overlaps the first end of the axle.

4. A line strainer as claimed in either claim 1 or claim 2, wherein the recess is positioned on the bearing member such that in use at least a portion of the recess always overlaps a surface of at least one intermediary electrically conductive component between the conductive link and the first end of the axle.

5. A line strainer as claimed in any one of claims 1 to 4, wherein the bearing member includes at least one elongate recess on either side of an aperture in the bearing member.

6. A line strainer as claimed in any one of claims 1 to 5, wherein the bearing member is configured to rotate relative to the spool when in a non-secured state.

7. A method of electrically connecting a first fence line and a second fence line to each other, including the steps of:

attaching the first fence line to a first line strainer as claimed in any one of claims 1 to 6;

attaching the second fence line to a second line strainer as claimed in any one of claims 1 to 6; and

securing an electrically conductive link to the respective securing mechanisms of the first line strainer and the second line strainer.

8. An electric fence system, including:

a first fence line attached to a first line strainer as claimed in any one of claims 1 to 6;

a second fence line attached to a second line strainer as claimed in any one of claims 1 to 6; and

an electrically conductive link secured to the respective securing mechanisms of the first line strainer and the second line strainer.

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FIG. 1A

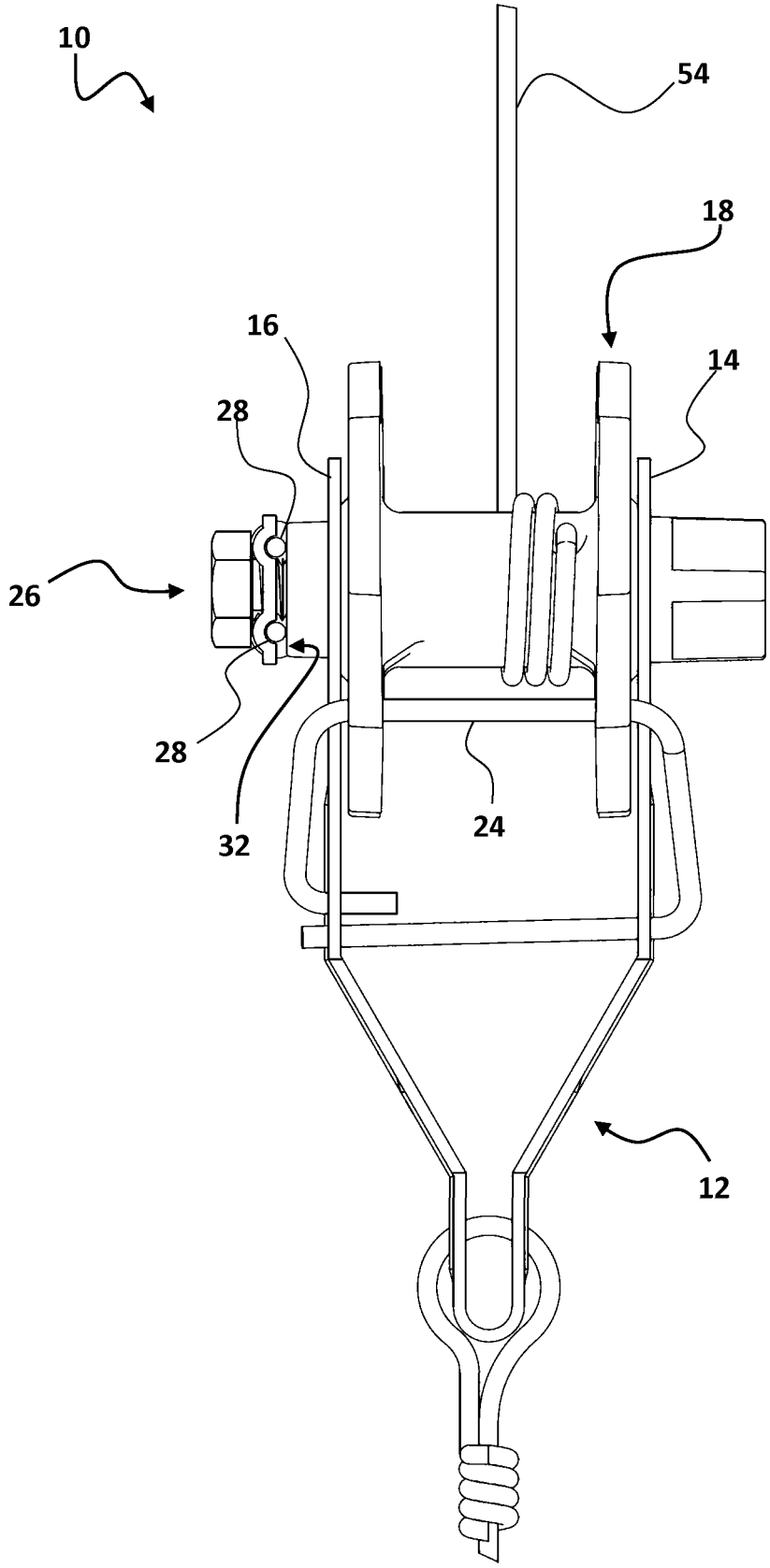

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FIG. 1B

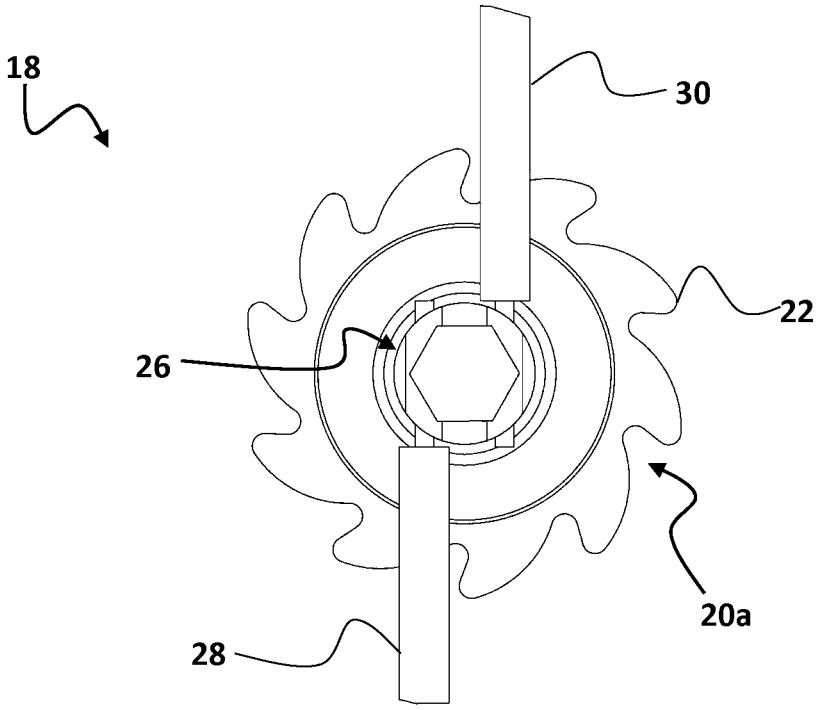

FIG. 1C

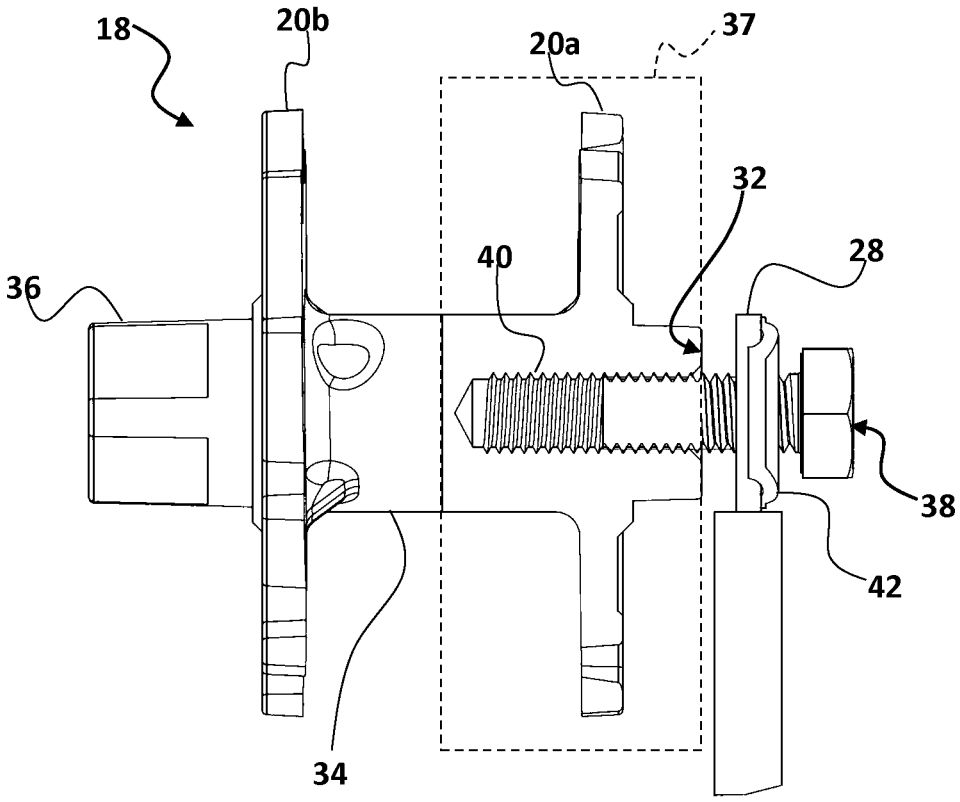

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FIG. 1D

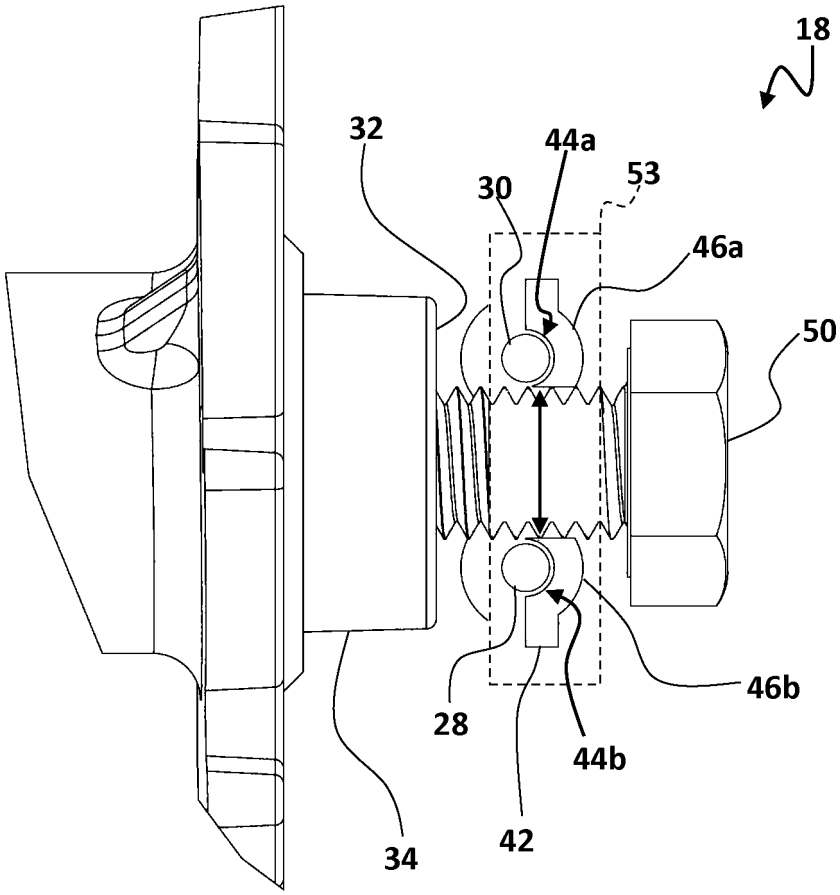
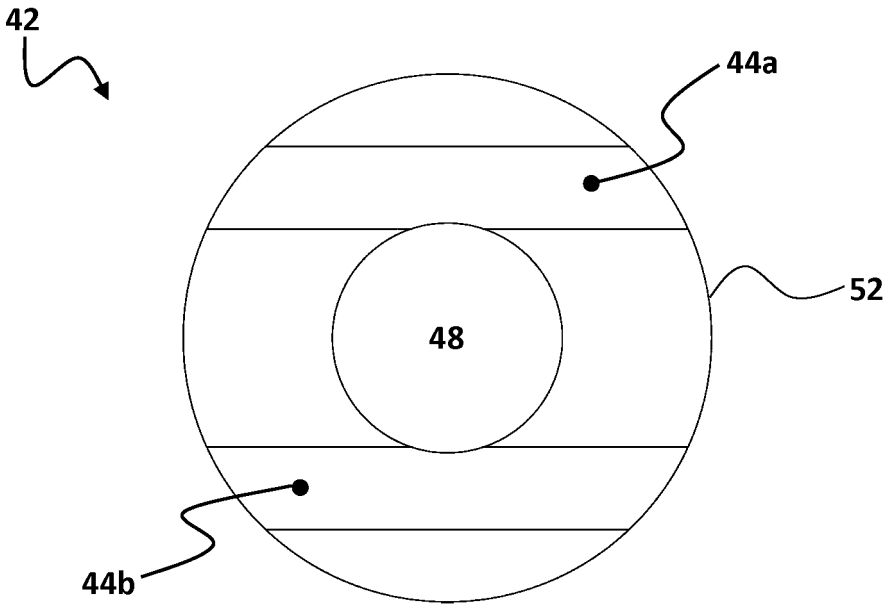


FIG. 1E



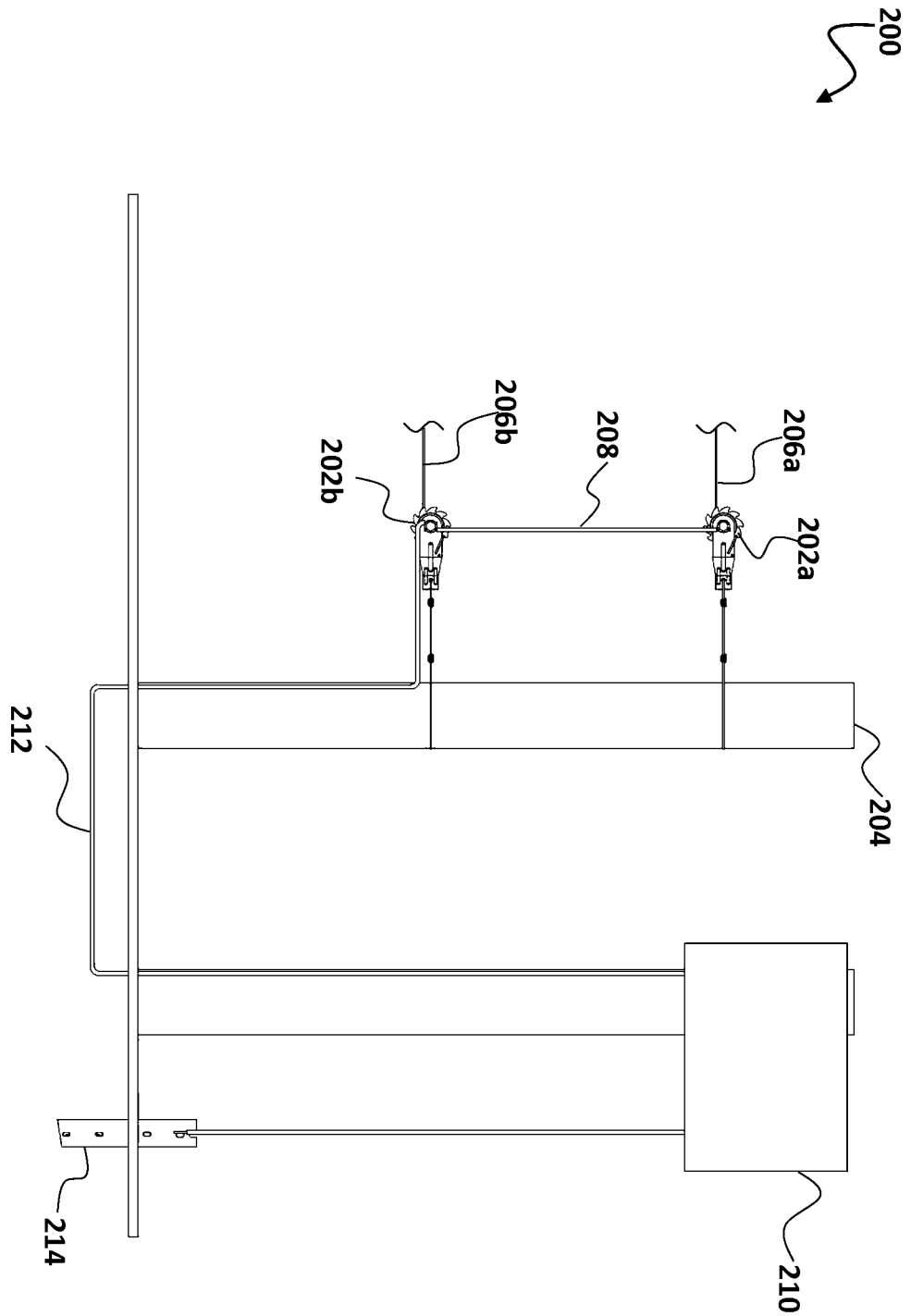


FIG. 2