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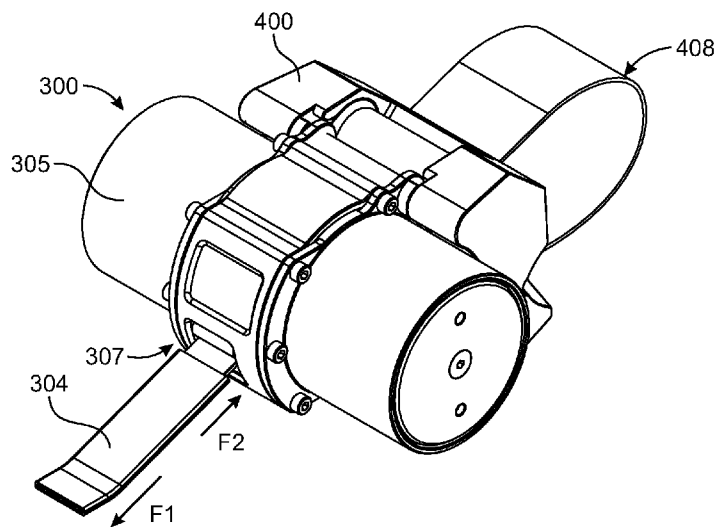


FIG. 12

(57) Abstract: Described herein is a device and methods or uses thereof may be a restraint or braking system for slowing, restraining or stopping movement of an animal in a controlled manner. Further described is an attachment feature that may be used to link the device to an anchor. The device may be a braking device. Disclosed also is a method and device for use in rodeo roping events. In one embodiment, the device comprises at least one kinematic control system; at least one driven member, and the kinematic control system and at least one driven member are operatively connected such that when a first force is applied to the driven member in a first direction corresponding to animal movement relative to the braking device, the kinematic control system applies a second force to the driven member in a second direction which counteracts the first force applied to the driven member.

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MOVEMENT CONTROL SYSTEM AND METHOD OF USE**RELATED APPLICATIONS**

This application derives priority from New Zealand provisional patent application number 764994 with a
5 filing date of 2 June 2020 incorporated herein by reference.

TECHNICAL FIELD

Disclosed herein is a device, attachment feature and methods and uses thereof for controlling the
movement of an object such as an animal under predetermined kinematic conditions. The device and
10 methods or uses thereof may be a restraint or braking system for slowing, restraining or stopping
moment of an animal in a controlled manner. The attachment feature may be used to link the braking
device to an anchor. Disclosed is a method and device for use in rodeo roping events.

BACKGROUND

15 There are many situations where it is desirable to control the movement of an animal such as within a
vehicle, at sporting events such as rodeo roping events, or limiting movement within predefined areas.
For example, restraining or limiting movement of an animal within a vehicle such that the animal can
move to a limited extent e.g. to ensure comfort of the animal. Any device or method of control of an
animal should account for the safety and welfare of the animal to ensure no additional harm is placed on
20 the animal through use of the device or method.

Sporting events such as rodeos include for example tie-down roping of calves which involve roping and
stopping a running calf by a mounted rider. In tie -down roping a rider must capture a running calf with a
rope and bring the calf to a stop as quickly as possible before dismounting and approaching the calf. The
rope used by the rider to capture the calf is attached at one end to the horn of the saddle and the other
25 end forms the lasso which is used to rope the calf. When the calf is roped the horse is trained to come to
an abrupt stop which in turn quickly stops the running calf as the rope becomes tight between the horse
and calf. Occasionally the calf may be jerked onto its side or backward by the stopping action in a so-
called 'jerk-down'. The jerk-down, and other scenarios where the stopping action causes the calf to lose
its footing or to spin quickly or violently have the potential to cause harm to the calf.

30 The prior art devices for use in roping events include the Ropersmate™ which is an elongate metal device
which may be attached at its proximal end to the saddle. A rope is threaded through the device and
follows a tortuous path such that the rope can be drawn through the device when an animal is roped. In
use, as the rope is drawn through the device by the animal pulling against the rope, frictional resistance
to movement of the rope is created by the rope following the tortuous path within the device. Pulling
35 the rope through the device can cause rope damage such as fraying. The Ropersmate device is relatively

long metal plate which when fitted to the saddle hangs down adjacent the withers of the horse. This can be a distraction for the rider or horse as the long metal device bounces and moves about during high speed movements of the horse in rodeo events or other uses where the horse and rider are moving.

Attachment of the Ropersmate™ to the saddle is usually by a short length of rope which is secured about the horn of the saddle. The horn is usually free of attachments and serves as a hand hold for the rider, or a location to place the rope. The presence of another binding or rope on the horn reduces the available space for these normal attachments or use as a handhold and increases the likelihood that the Ropersmate may become entangled with the rope. Similarly, the mane of the horse should be kept clear of the rope as it enters the device, otherwise it risks becoming entangled within the device and causing injury to the horse.

Another art publication is the restraint device described in US2019/0208748. In this publication, an animal lead device is described with a braking device at one end. The braking device comprises a sprung line so that when the animal moves relative to the holder of the device, the line extends but prevents or slows animal movement by the line extension pulling against the spring bias.

It may be useful to provide a device, attachment feature, methods or uses thereof that address at least some of the avoid disadvantages or, at least provide the public with a useful choice.

Further aspects and advantages of the device, attachment feature and methods and uses thereof will become apparent from the ensuing description that is given by way of example only.

SUMMARY

Described herein is a device and methods or uses thereof may be a restraint or braking system for slowing, restraining or stopping moment of an animal in a controlled manner. Further described is an attachment feature that may be used to link the device to an anchor. The device may be a braking device. Disclosed also is a method and device for use in rodeo roping events.

In a first aspect, there is provided a braking device for controlling the movement of an animal attached thereto, the device comprising:

at least one kinematic control system;

at least one driven member,

wherein the kinematic control system and at least one driven member are operatively connected such that when a first force is applied to the driven member in a first direction corresponding to animal movement relative to the braking device, the kinematic control system applies a second force to the driven member in a second direction which counteracts the first force applied to the driven member.

In a second aspect, there is provided an attachment feature configured to link a braking device to an

anchor, the attachment feature comprising:

a body with:

a first attachment side to link the attachment feature to the braking device; and

a second attachment side to releasably link the attachment feature to the anchor.

5 In a third aspect, there is provided a device configured to resist movement of an animal, the device comprising:

a braking device substantially as described above; and

an attachment feature substantially as described above.

10 In a fourth aspect, there is provided a device configured to slow and then subsequently halt movement of an animal, the device comprising:

a braking device substantially as described above; and

an attachment feature substantially as described above.

In a fifth aspect, there is provided a method of controlling the movement of an animal via the steps of:

selecting a braking device substantially as described above;

15 attaching the animal to the braking device; and,

wherein, when the animal has a greater relative speed than the braking device, movement of the animal is controlled by actuation of the braking device to resist further relative movement of the animal.

20 In a sixth aspect, there is provided a method of reducing the speed of an animal prior to stopping movement of the animal by the steps of:

selecting a braking device substantially as described above;

attaching the animal to the braking device; and,

wherein, when the animal has a greater relative speed than the braking device, relative movement of the animal is slowed and subsequently stopped by actuation of the braking device.

25 In a seventh aspect, there is provided the use of a braking device substantially as described above to resist movement, or to slow and subsequently halt movement, of an animal attached thereto.

Selected advantages of the above device, attachment feature, methods and uses thereof may comprise the provision for controlled relative animal movement to an extent where some braked animal or object movement is possible prior to halting movement. In a rodeo setting, this advantage may allow for
30 braked and then halted movement of animal thereby at least partly addressing this aspect of animal safety and welfare in particular, by preventing animal jerk down.

BRIEF DESCRIPTION OF THE DRAWINGS

Further aspects of the device, attachment feature, methods and uses thereof will become apparent from the following description that is given by way of example only and with reference to the accompanying drawings in which:

- | | | |
|----|------------------|---|
| 5 | <u>Figure 1</u> | shows a side view of a first embodiment of braking device mounted on a saddle, the saddle mounted on a horse; |
| | <u>Figure 2</u> | shows a perspective view from in front of the braking device mounted on a saddle; |
| | <u>Figure 3</u> | shows a detail perspective view from above of the braking device attached to the saddle; |
| | <u>Figure 4</u> | shows a perspective view from above of the braking device detached from a saddle; |
| 10 | <u>Figure 5</u> | shows a detailed perspective view from above and behind the braking device attached to a saddle; |
| | <u>Figure 6</u> | shows a side view of the braking device attached to a saddle; |
| | <u>Figure 7</u> | shows a perspective view of a length of webbing extending from the braking device with rope attached; |
| 15 | <u>Figure 8</u> | shows a cross section front elevation view of the above first embodiment of the braking device; |
| | <u>Figure 9</u> | shows a schematic cross-section side view of the braking device and a spool therein; |
| | <u>Figure 10</u> | shows perspective views of the braking device key parts when separated being a conductor portion (left) and a magnetic portion (right); |
| 20 | <u>Figure 11</u> | shows a side view of the magnetic portion of the braking device with a representation of magnetic force lines in the magnetic array; |
| | <u>Figure 12</u> | shows a perspective view from above of a second embodiment of a braking device linked to an attachment feature; |
| | <u>Figure 13</u> | shows a perspective view from below of the second embodiment of the braking device linked to an attachment feature; |
| 25 | <u>Figure 14</u> | shows an exploded perspective side view of the braking device and attachment feature; |
| | <u>Figure 15</u> | shows an part exploded perspective view from above of the braking device of the second embodiment; |
| | <u>Figure 16</u> | shows a fully exploded perspective view from above of the braking device of the second embodiment; |
| 30 | <u>Figure 17</u> | shows an exploded perspective view from above of the braking device magnetic portion; |
| | <u>Figure 18</u> | shows plan, front cross-section and side views of the magnetic portion of the braking |

device;

- Figure 19 shows a perspective view from below of the attachment feature of the second embodiment;
- Figure 20 shows a side view of the attachment feature of the second embodiment;
- 5 Figure 21 shows a bottom view of the attachment feature of the second embodiment;
- Figure 22 shows a rendered perspective view from a left side of a second embodiment of a braking device linked to an attachment feature along with a shaped pad;
- Figure 23 shows a rendered perspective view from a left side of the second embodiment of the braking device linked to an attachment feature with the shaped pad removed;
- 10 Figure 24 shows a rendered perspective view from a right side of the attachment feature with covers removed to illustrate the attachment points;
- Figure 25 shows a rendered perspective view from a right side of a second embodiment of a braking device linked to an attachment feature along with a shaped pad;
- Figure 26 shows a rendered perspective view from a right side of the second embodiment of the braking device linked to an attachment feature with the shaped pad removed;
- 15 Figure 27 shows a rendered perspective view from a left side of the attachment feature with covers removed to illustrate the attachment points;
- Figure 28 shows a rendered side perspective view from a right side of the attachment feature with covers and a rack and pin cover removed to illustrate the attachment mechanism;
- 20 Figure 29 shows a side image of the braking device attached to a horse in a rodeo setting, the horse rider about to lasso a calf;
- Figure 30 shows a side image of the rider capturing the calf via the lasso and the horse beginning to brake, the rope not yet tensioned;
- Figure 31 shows a side image of the rope now in tension, the braking device now acting to slow calf movement relative to the anchor (the saddle on the horse);
- 25 Figure 32 show a side image of the rope fully tensioned and relative animal movement now stopped.

DETAILED DESCRIPTION

As noted above, described herein is a device and methods or uses thereof may be a restraint or braking system for slowing, restraining or stopping moment of an animal in a controlled manner. Further described is an attachment feature that may be used to link the device to an anchor. The device may be a braking device. Disclosed also is a method and device for use in rodeo roping events.

For the purposes of this specification, the term 'about' or 'approximately' and grammatical variations thereof mean a quantity, level, degree, value, number, frequency, percentage, dimension, size, amount, weight or length that varies by as much as 30, 25, 20, 15, 10, 9, 8, 7, 6, 5, 4, 3, 2, or 1% to a reference quantity, level, degree, value, number, frequency, percentage, dimension, size, amount, weight or length.

The term 'substantially' or grammatical variations thereof refers to at least about 50%, for example 75%, 85%, 95% or 98%.

The term 'comprise' and grammatical variations thereof shall have an inclusive meaning - i.e. that it will be taken to mean an inclusion of not only the listed components it directly references, but also other non-specified components or elements.

The term 'braking' and 'control' or grammatical variations thereof as used herein refer generally to the steps of restraining or limiting movement of an animal or object attached to the devices described herein when the kinematic actions described herein occur.

It should be appreciated that the term 'attached' includes both direct and indirect attachment between two or more articles. Direct attachment includes where the articles are provided with complementary components of an attachment feature, or the articles are attached so as to abut against one another; indirect attachment includes where the articles are attached to one another via an intermediate member.

Braking Device

In a first aspect, there is provided a braking device for controlling the movement of an animal attached thereto, the device comprising:

at least one kinematic control system;

at least one driven member,

wherein the kinematic control system and at least one driven member are operatively connected such that when a first force is applied to the driven member in a first direction corresponding to animal movement relative to the braking device, the kinematic control system applies a second force to the driven member in a second direction which counteracts the first force applied to the driven member.

Driven Member

The driven member may be a shaft that rotates in a first direction on application of the first force.

Kinematic Control System

The kinematic control system may be a brake mechanism that slows or halts shaft first direction rotation movement by applying the second force on the shaft in a second direction opposite to the first direction.

The terms brake mechanism, braking mechanism or grammatical variations thereof may hereafter be used interchangeably and reference to these terms incorporates kinematic control systems.

Operative Connection / Line

The braking device driven member and animal may be operatively connected via a line.

The line may extend and retract from and to the braking device, where line extension and retraction being relative to animal movement occurs when an animal is connected to the braking device and the animal is moving relative to the braking device.

The line may be a length of flexible material which may be selected from: a rope, cord, cable, tape, webbing or any other similar such material.

The flexible material may be formed from a polymer such as nylon, nylon-blended polymers, polyesters, or other materials. Alternatively, or additionally, the material may be a natural material such as cotton, hemp or flax.

The line may be provided with an attachment means at the distal end thereof for attachment of for example a rope or cable.

In one embodiment, the line may be approximately 500mm to 2000m long. The line length may be an important, tuneable variable that greatly effects the performance of the roping device, particularly in rodeo settings. A long line length provides a soft stop but does not come to a hard stop quickly, increasing the time of the rider's run as they wait for the calf to slow and/or settle. A short line length brings the calf to a quick stop but risks jerking them down like the way a traditional rope or lariat would, with little damping in the system. Testing has shown that 1000-1100mm may be about the right length for safe use with professional cowboys. At 800mm the calves come close to being jerked down and 1500mm provide further pay-out once the calf had stopped. These dimensions may however vary by application, animal (calf or steer) weight and speed, and operator/rider ability. The length of the line may be less than 500mm (10mm to 500mm) where, for example, the braking device is to be used to restrain or control animals within vehicles. Alternatively, the line may be substantially longer than 2000mm (for example, from 2m to 5 m or from 1m to 10 m) where there is mainly the need to slow the speed of an animal at a certain point or distance beyond the location of the braking device.

The flexible material may be formed of a sufficiently robust material to permit repeated use of the braking device in stopping or braking events without undue wear of the flexible material.

Tubular Webbing

The line as described above may in one embodiment be a tubular webbing.

The line flexible material may, in a preferred embodiment, be in the form of a flattened tube at the distal end thereof wherein a length of rope or cable or other such material may be inserted at least partway within the flexible material. In one embodiment, the rope is a lariat. Alternatively, a separate length of tubular flexible may be attached to the flexible material of the braking device by, for example, stitching the two lengths of flexible material together.

The use of tubular webbing may be a useful feature for the success of the device in use at rodeos. The tubular webbing may continue from the webbing start to finish i.e. from one end of the webbing which is retained inside the device all the way through to beyond what is called the keeper rope which hangs down from a horse bridle.

Feeding and retaining the lariat or lasso rope inside the tubular webbing allows both effective load transfer and provides the rider with sufficient feel and control of the lariat when roping a calf.

A simple knot at the end of the tubular webbing which connects to the lariat is sufficient to retain the lariat within the tubular webbing without the need to use other attachment or fixing means.

The distal end of the tubular webbing is ideally 300-1500mm beyond where it passes through the keeper rope to reduce the possibility that the knot catches on the keeper rope.

The flattened tube form of the flexible material may in further embodiment extend for part or all of the length of the line. Where the flattened tube extends for part of the length of the line, then it may in a preferred form extend from the extend distally from the opening or nozzle of the braking device.

Line Storage/Receiving Element

The line may wrap onto the driven member directly or indirectly (shaft).

The line may be retained inside the braking device, for example inside the housing.

Indirect wrapping may be where the line wraps onto a receiving element, the receiving element being configured to allow extension and retraction of line therefrom.

The receiving element may link directly or indirectly to the driven member. In one embodiment, the receiving element may be a drum or spool.

The drum or spool may be configured to rotate to pay out or receive line.

Nozzle

The line may pass through a nozzle located in an opening in the braking device.

The opening may be in the braking device housing.

The nozzle may guide and support the line as it is extended and retracted from the braking device.

The nozzle shape may match the dimensions and profile of the line so as to be configured to prevent line twisting and jamming as it is extended from or retracted into the braking device.

- 5 The nozzle may be integral to the braking device.

The nozzle may in one embodiment be removable from the housing.

The nozzle may be a pair of substantially parallel rods or bars through which the line passes during extension and retraction of the line.

The bars or rods may be fixed along their longitudinal axis

- 10 The bars or rods may be flexible along their longitudinal axis.

The nozzle may have a substantially rectangular opening.

The nozzle may be formed from two substantially U-shaped pieces, which, when placed together form a substantially elongate rectangular opening therebetween.

- 15 In more detail, a nozzle may be provided to guide and support for the flexible material, such as webbing, as it is extended and retracted from the braking device. The nozzle may take a variety of forms which reflect the shape and configuration of the flexible material passing therethrough. For example, a webbing material may generally be relatively flat and flexible, and may as a result be prone to twisting. Providing a nozzle which matches the dimensions and profile of the webbing material reduces the likelihood of twisting and jamming of the webbing material as it is extended and withdrawn into the
20 braking device.

- The nozzle may form an integral part of the braking device. In an alternative embodiment, the nozzle may be removable as it is subject to wear and damage through repeated use. The nozzle may, for example, take the form of a pair of substantially parallel rods or bars through which the flexible material can pass. The bars or rods may be fixed, or rotatable along their longitudinal axis to allow the flexible
25 material to pass therebetween with little resistance or drag. Alternatively, the nozzle may be a device with a substantially rectangular opening to allow passage of the flexible material without twisting or jamming.

- The nozzle may be fabricated as a single part or multiple pieces. For example, it may be formed from two substantially U-shaped pieces, which when placed together form a substantially elongate rectangular
30 opening therebetween.

The nozzle preferably fabricated from a material which offers little resistance to the passage of the flexible material and is more preferably non-damaging to the flexible material, for example, materials such as polyethylene based polymers or polyoxymethylene.

In other embodiments, the nozzle may be a metal, such as steel, aluminium or alloys that are preferably corrosion resistant and maintain a smooth surface when used.

Braking is in Direction Opposing Movement of the Animal

- 5 The braking device may be configured to produce a braking force that acts predominantly against the direction of movement of an animal to which the device is connected. That is, the braking device braking action acts directly against an opposing force.

Device Braking Response Dependent on the Rate of Animal Movement

- 10 The braking force imposed by the braking device may be responsive to the rate of movement or speed of movement of an animal attached to the braking device. The responsiveness may be linear or directly proportional to the rate of movement or speed of the animal. Alternatively, the responsiveness may be non-linear and indirectly proportional to the animal rate of movement or speed of movement.

- Using the example of a spool and line, in a direct relationship, faster pay out of line from the spool may
 15 elicit a proportional braking effect from the braking device than a slower pay out of line. In an indirect relationship, faster pay out of line from the spool may elicit an initial light and then stronger braking effect from the braking device than a slower pay out of line where a strong braking effect might occur immediately.

- Pay out of line from the spool below a predetermined rate may incur no braking effect from the braking
 20 device.

Partial Movement and Subsequent Halt in Movement

- When the first force is applied to the braking device, line extension may occur prior to further line
 extension halting. Line extension may occur for a pre-determined period of time prior to line extension
 25 halting. The extent of line extension prior to a halt in extension may correspond to the animal being able to still undergo braked relative movement for a period of time prior to a halt in relative movement.

- The extent of braked relative movement may be governed by the length of line on the braking device. As
 noted above, the length of line that extends from the braking device may be approximately 500-2000mm
 long and hence, braking of movement occurs for a time period corresponding to the time taken for this
 30 length of line to extending from the braking device. This time period may vary depending on the relative speed difference.

Once the length of line is fully extended, no further relative movement may occur and line pay out halts causing a halt in relative movement between the animal and braking device.

The time between braking and a halt in movement may be varied by altering the length of line layout prior to a halt in line pay out and by adjusting the braking mechanism to alter the rate of braking that may occur.

5 *Resetting*

The braking device may be configured to be reset to a starting condition automatically and repeatedly.

Where the braking device comprises a line, once an extending force is removed from the line, the line may then re-set by retracting back to the braking device. Retraction may be by winding of line onto the driven member (a shaft). Re-setting may be at a control speed. The braking mechanism may control the rate of retraction and re-set.

Braking Mechanism Types

The braking mechanism may be configured to brake driven member movement (shaft rotation) by mechanisms selected from: frictional means, biasing means, magnetic means, and combinations thereof.

15 In one embodiment, the frictional means may be a torque ring.

The biasing means may be a spring.

The magnetic means may be a magnetic attraction and/or repulsion force.

The magnetic means may be an eddy current force caused by relative movement between an electrical conductor and a magnet field.

20

EC Braking

The braking device in one embodiment may be an eddy current (EC) brake comprising at least one magnet and at least one electrical conductor, wherein relative movement of the magnet and electrical conductor in proximity to one another creates an eddy current force which acts in a direction opposing the direction of relative movement of the magnet and conductor.

EC braking provides a non-friction based means of braking that may be useful to avoid prior art issues like rope fraying from friction based braking mechanisms.

Magnet Array

30 The at least one magnet in the above EC braking embodiment may be a magnet array.

The at least one electrical conductor may be configured to interact with the magnet array such that an eddy current is induced by relative movement of the magnet array and conductor during pay out of line

from the braking device.

The braking device may comprise 1-16 or 2-8 or 2-4 magnet arrays.

In one embodiment, the EC braking mechanism may be in the form of at least one an array of magnets arranged in proximity to at least one conductor such that an eddy current is created by relative
5 movement of the magnet array and conductor.

Magnet Array Shapes

Where there is more than one substantially linear array of magnets then the arrays may be arranged in one or more overlapping layers. Preferably, the magnets between adjacent layers are arranged to face
10 one another. Alternatively, the magnets of adjacent layers may be arranged to face away from another. In a further embodiment, the circular arrays may fully or partially overlap with one another, for example, in a concentric arrangement. The arrays may, in a further embodiment not overlap with one another, such as when they are arranged in a coaxial arrangement.

Where the magnetic arrays are circular, then the arrays may be arranged substantially concentrically
15 about a common axis. In another embodiment, the circular arrays may be arranged coaxially and adjacent and not concentrically.

The magnets may be arranged such that the polarity of magnets adjacent or facing one another is different. That is, magnets adjacent one another on an array may be arranged to have their polarities to the same or different from one another.

20 The device may comprise arrays which are formed from one or more rows or lines of magnets.

Magnet Polarity

The magnet array may be configured so that two or more magnets in the array may be adjacent or facing one another. The polarity of magnets adjacent each other in this embodiment differ or are the same.

25 In one embodiment, the position and polarity of the magnets may be selected to optimise the magnetic field strength of the magnets of the configuration of the magnet array(s). For example, in an embodiment where there two concentrically arranged circular arrays are formed by a radially innermost array (inner array) and a radially outermost array (outer array), the magnets of the inner array face radially outward towards the magnets of the outer array which correspondingly face radially inward
30 towards the inner array.

In a further preferred embodiment, every magnet on the inner and outer array may be located adjacent two other magnets such that no two adjacent magnets have the same pole facing in the same direction.

In a further embodiment, the magnets of the inner array may have a south pole facing towards a mutually opposing magnet located on the outer array which has its north pole facing the magnet of the

inner array, and vice versa.

Two Concentric Arrays

5 The braking device may comprise two concentrically arranged circular arrays formed from a first, radially innermost array (inner array) and second, radially outermost array (outer array), the magnets of the first array facing radially outward towards the magnets of the second array which correspondingly face radially inward towards the first array.

Conductor Shape

10 The conductor has a form complementary to that of the corresponding magnet array form.

If the magnet array is a circular or tubular array, then a corresponding conductor may have a circular or tubular shape and the circular or tubular conductor may be arranged concentrically with the circular or tubular magnetic array.

15 For example, where the magnet array is a circular or tubular array, then a corresponding conductor may be circular or tubular. Preferably, the circular or tubular conductor is arranged concentrically with the circular or tubular magnetic array. More preferably, where there are more two or more concentric magnetic arrays are present, then a corresponding concentric conductor is placed between or adjacent each of the magnetic arrays.

20 *Braking Device Construction*

In a further embodiment, the braking device may be constructed in part or entirely from a conductor material such that relative movement of the one or more magnetic arrays within the device and the conductor part or parts of the braking device interact to create an eddy current force.

25

Device Housing

The braking device may have a cylindrical housing with line extending to and from the cylindrical housing.

30 The braking device is relatively compact. The braking device is very compact relative to a full-size SRL devices incorporating EC braking such as the TruBlue™ autobelay device or a 3M fall protection device.

To ensure a compact structure, the manufacturing tolerances may be relatively high and the distances between moving components may typically be very small. For example the distance between the magnets and conductors at their closest point may be approximately 0.5 millimeters. By comparison, the

distance between magnets and conductors in full size SRL devices may be several millimetres.

A further feature which arises from the compact nature of the device is that sometimes the magnetic flux can escape between the magnets and conductors. This may be addressed by, for example, extending the length of the conductors beyond the magnets. In one embodiment, the length may be extended by approximately 3 millimeters or so.

Using curved magnets and conductors may allow the distance between the magnets and conductors to be further reduced and/or reducing the overall diameter of the device thus making it even more compact.

10 **Attachment Feature**

In a second aspect, there is provided an attachment feature configured to link a braking device to an anchor, the attachment feature comprising:

a body with:

a first attachment side to link the attachment feature to the braking device; and

15 a second attachment side to releasably link the attachment feature to the anchor.

First Attachment Side Details

The first attachment side may comprise a first portion comprising one or more finger features shaped to complement the shape of a pin or shaft on the braking device.

20 The first portion one or more fingers may be located about the top of the first attachment side.

The first portion one or more fingers may extend away from the attachment feature body.

The one or more fingers may extend orthogonally away from the attachment feature body.

The one or more fingers may be hook shaped.

The one or more fingers may extend generally upwards relative to the attachment feature.

25 The one or more fingers may define an opening and the opening defines a direction generally parallel to the first attachment side so that the finger opening(s) are configured to located a pin or shaft of the braking device in a direction parallel to the first attachment side.

The first attachment side may comprise a second portion comprising openings in the first attachment side body that are configured to align with openings in the braking device or a part thereof when the braking device is fitted correctly to the attachment feature, the openings configured to receive a fastener therethrough.

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The fastener may be a pin that releasably fits into and is removable from the opening(s).

Second Attachment Side Details

The second attachment side may comprise webbing, the webbing at one end attached to a first portion of the second attachment side and at the other end configured to thread into a tightening means, the tightening means located on the second attachment side at a second portion, the distance between the first and second portions defining a length of webbing for connection to the anchor.

The webbing may extend outwardly from the body of the attachment feature.

The webbing may extend in an orthogonal direction to the first and second portions or the second attachment side.

The first portion of the second attachment side may be a first support. The webbing may be permanently stitched onto the support. The first portion is located at a lower side of the attachment feature.

The second portion of the second attachment side may be a second support that acts as a tightening means – that is the second portion and tightening means may be the same item. The webbing is

releasably attached to the second support.

The second support in this embodiment may be a rotating shaft intermediate the opposing side plates of the body, wherein the open end of the webbing is threaded onto or through the shaft and, as the shaft rotates, webbing is wound onto the shaft.

The attachment feature may further comprise a stop member that is biased to cause the second support to only allow the tightening means to reduce the webbing length relative to the first portion and prevent lengthening of the webbing between the first portion and second portion.

The stop member may be a latch or pawl biased to interfere with a complementary notch or opening on the tightening mechanism and prevent lengthening movement of the second portion or tightening mechanism.

Reverse movement and untightening of the webbing may be affected by causing movement against the bias to the move the stop away from the second portion and allow reverse movement.

The webbing between the first and second portions, may wrap about a portion of the anchor to link the attachment feature to the anchor.

Anchor is a Saddle

The anchor may be a saddle or part thereof. The anchor may be the pommel of a saddle. Alternatively, the anchor point may be located elsewhere on the saddle. This may be the case where the saddle does not have a horn or sufficiently sized pommel area to accommodate the device. There may be other

reasons to locate the braking device other than at the pommel area of a saddle.

The attachment feature may attach to the saddle pommel at a point below the horn of the saddle.

When attached to a saddle and the saddle is on a horse, the attachment feature may be above and does not rest on the withers of the horse. The attachment feature does not rest on any part of the horse in use.

The attachment feature, when attached to a saddle and horse and also attached to the braking device, keeps the braking device above and not resting on the withers of the horse. The attachment feature keeps the braking device from resting on any part of the horse in use.

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Removable Inserts

The attachment feature may further comprise an attachment adaptor. The attachment adaptor may be a removeable insert. The removable insert (or inserts if desired) may be configured to accommodate on one side the shape of the attachment feature and on the opposing side, has a shape that substantially conforms to the anchor shape (or saddle or saddle part where the anchor is a saddle). The removable insert may be a pad or cushion. The cushion made be manufactured from a solid or semi-solid material. The material may have at some degree of resilience so as to comply with contours on the anchor and therefore assist in creating a firmer connection. The cushion may be manufactured from a material with a high coefficient of friction.

20 The attachment adaptor may be provided to facilitate attachment of the braking device to an anchor point such that the attachment adapter is located or disposed at least in part between the braking device and the anchor point. It will be appreciated that it may be desirable to be able to attach the braking device to a range of anchor points and that the shape and configuration of different anchor points may vary substantially from one another. The attachment adapter therefore may be provided in a range of forms to permit the same braking device to be attached to different anchor points. As such, the attachment adapter may be in the form of a removable insert with an engagement face or region which is complementary or otherwise configured to cooperate and facilitate attachment of the braking device to an anchor point.

30 The attachment adapter may be a modular system comprising a base portion for attachment to the braking device and separate removable insert which serves as an engagement face or region to be attached or cooperate with an anchor point/region. The base portion and removable insert may be manually disengaged from one another by for example simple releasable fastening device or clipping arrangements, or threaded bolts, or other means known in the art.

In use, where the braking device is to be moved from one anchor point to another anchor point of a different configuration or simply removed from the anchor point, then the removable insert may be

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disengaged from the base portion located on the braking device. Where the braking device is to be relocated from a first anchor point to a second anchor point with a different configuration, then the braking device and base portion of the attachment feature may be disengaged from the removable insert of first anchor point and attached to a corresponding removable anchor point of the second anchor point.

In a further embodiment, the base portion of the attachment adapter may be formed as part of or integrated with the body of the braking device. The removable portion of the attachment adapter may be provided separately in a range of forms. For example, the attachment adapter may form part of or be attachable to a saddle, or a seat belt arrangement, or attachment point within a vehicle.

In a further embodiment, the attachment adapter may be attached to or from part of one or the other of the anchor point or the braking device. In a preferred embodiment, the attachment adapter is attached only to the braking device. The braking device may be secured to the anchor point by one or more attachment means such as clips, buckles or straps and/or releasable fasteners such carabiners. These attachment means are exemplary and there are many other ways of effecting attachment between the braking device and an anchor point.

Integral or Not Integral

The attachment feature and anchor may be separate items that may be manually disengaged from one another.

The attachment feature and braking device may be separate items that may be manually disengaged from one another.

Alternatively, the attachment feature may be formed as part of or integral to the braking device e.g. as an extension to the braking device housing.

Device with Attachment Feature and Mount Point to Resist Movement

In a third aspect, there is provided a device configured to resist movement of an animal, the device comprising:

- a braking device substantially as described above; and
- an attachment feature substantially as described above.

Device with Attachment Feature and Mount Point to Slow and Halt Movement

In a fourth aspect, there is provided a device configured to slow and then subsequently halt movement of an animal, the device comprising:

a braking device substantially as described above; and
an attachment feature substantially as described above.

Method of Controlling Animal Movement

5 In a fifth aspect, there is provided a method of controlling the movement of an animal via the steps of:

selecting a braking device substantially as described above;

attaching the animal to the braking device; and,

wherein, when the animal has a greater relative speed than the braking device, movement of the animal is controlled by actuation of the braking device to resist further relative movement of the
10 animal.

Optionally, in the above method, the braking device further comprises an attachment feature substantially as described above and the attachment feature links the braking device to an anchor.

Reducing Animal Speed Prior to Stopping Movement

15 In a sixth aspect, there is provided a method of reducing the speed of an animal prior to stopping movement of the animal by the steps of:

selecting a braking device substantially as described above;

attaching the animal to the braking device; and,

wherein, when the animal has a greater relative speed than the braking device, relative
20 movement of the animal is slowed and subsequently stopped by actuation of the braking device.

Optionally, in the above method, the braking device further comprises an attachment feature substantially as described above and the attachment feature links the braking device to an anchor.

Use of the braking device, attachment feature or device

25 In a seventh aspect, there is provided the use of a braking device substantially as described above to resist movement, or to slow and subsequently halt movement, of an animal attached thereto.

Optionally, in the above use, the braking device further comprises an attachment feature substantially as described above and the attachment feature links the braking device to an anchor.

Advantages

30 Selected advantages of the above devices, attachment feature, methods and uses thereof may comprise:

- Relative animal movement controlled;
- Some braked animal movement is possible prior to halting movement;
- The braked and then halted movement address this aspect of animal safety and welfare preventing jerk down in a rodeo setting;
- 5 - The design, especially where EC braking is used, does not impact the rope at all and hence removes any issues around rope fraying;
- The design is compact and does not interfere with natural horse and rider movement;
- The braking device attaches to a saddle at a point distant to the horn of the saddle thereby leaving this area free for normal use;
- 10 - The braking device is small enough and anchored far enough away from the horse mane so as not to interfere or catch the mane;
- The braking device automatically re-sets without user input;
- The braking device may be anchored to many different anchors (e.g. many different saddle shapes) in a releasable manner.
- 15 The embodiments described above 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, and any or all combinations of any two or more said parts, elements or features.

Further, where specific integers are mentioned herein which have known equivalents in the art to which the embodiments relate, such known equivalents are deemed to be incorporated herein as if individually
20 set forth.

WORKING EXAMPLES

The above described device, attachment feature, methods and uses thereof now described by reference to specific examples.

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EXAMPLE 1

In this first example, a first embodiment of brake is described with reference to Figures 1-11 where Figs 1-6 describe the basic set up and main parts; Fig 7 illustrate an example of webbing to rope connection; and Fig 8-11 show details of an EC braking mechanism.

- 30 A braking device 1 of one embodiment of the disclosure is shown in Figure 1. The braking device 1 is attached to the pommel region 2 of a saddle 4 which is mounted on a horse 6. In Figure 2, a length of webbing 8 extends through a nozzle 9 from within the braking device 1. A rope 10 is attached at its proximal end to a length of rope 10, Figure 2. The rope 10 is inserted and retained within the tubular end 11 of the webbing 8 by use of an overhand knot 13 adjacent the end of the webbing. The knot provides
35 enough retention force on the rope within the webbing to ensure it does not slip in use and is also easily undone when required. The rope 10 may be used in rodeo roping events, such as tie-down roping.

The nozzle 9 may endure high pay-out speeds and loads and ideally allows the webbing 8 to run silently (loud or unexpected noises can startle the horse). Two stationary stainless steel runners provide the upper and lower surfaces and smooth aluminium sides locate the webbing horizontally. The gap may be tight enough to not allow the webbing to flip over while spooling and to stop the webbing end stop from pulling into the device. The stationary runners can be replaced with PTFE rollers that further reduce the pay-out resistance and wear on the webbing. The nozzle position is below the centreline of the device when in use, with the webbing coming out from under the spool. This layout produces an upwards torque on the device when loaded during a catch, ensuring that it does not press down on the horse's withers.

The location of the braking device 1 when attached to the saddle 4 allows load transfer from the rope 10 through the saddle and to the horse. It is preferable that the device 1 avoid contact with the withers 12 (Figure 1) of the horse. The braking device 1 is provided with attachment points 14 to which shackles 16 as in Figures 3 and 4.

The form and location of the attachment points 14 are shown relatively close to the mid-point of the device 1 (Figures 3-4). However, attachment points 14 may be located adjacent the outer ends of the device 1 or at other points. Further, there may be provide one, two, three, four or more attachment points to provide, for example, a range of fitting options or alternative modes of attachment.

Mounting the device 1 relatively low position at the pommel region 2 of a saddle is preferred as it permits transfer a significant proportion of the load from the webbing 8 through the device 1 and to the pommel region 2 below the horn 18 (Figure 2).

If the horse has high withers or if the saddle is particularly low then the device 1 can be lifted slightly by adjusting the cord 20 (Figure 3) and/or straps 22 (Figure 5) to lift the braking device 1 closer to the horn of the saddle. The adaptor is removable and can be turned upside down to alter the position of the braking device.

A pair of parallel rods 23a 23b from the nozzle 9 through which the webbing 8 passes in use of the braking device.

The braking device 1 of Figures 5 and 6 is shown with a cord 20 in addition to a strap 22, both of which pass through the attachment points 14 to secure the device to the saddle.

In a further embodiment as shown in Figure 7, the distal end of a length of tubular flexible material forming the distil end of the webbing 11 has a length of rope 10 inserted therein and secured by an overhand knot 13.

EXAMPLE 2

Further detail of the first embodiment of braking device is described.

Figure 8 shows a cross-section of an embodiment of the braking device 100. A common shaft 101 extends through the longitudinal axis of the device 100. First 102a and second 102b cylindrical conductors are secured to and are rotatable with the shaft 101 which is mounted on bearings 103. First 104a and second 104b outer cylindrical magnetic arrays are arranged concentrically to substantially surround the first and second conductors 102a, 102b. Similarly, first 106a and second 106b inner magnetic arrays are arranged concentrically within the first and second conductors 102 a, b.

The inner and outer magnetic arrays are fixed to the first and second ends (not shown) of the braking device 100 and do not rotate.

A spool 108 is mounted approximately mid-way along the shaft 101 such that the conductors and spool are rotatable on the shaft. The spool 108, in use, carries a length of flexible webbing which can be wound on or off of the spool. When the spool 108 is rotated, then the conductors 102a, 102b also rotate between the inner 106a, 106b and outer magnetic arrays 104a, 104b to create an eddy current force which opposes the direction of rotation of the spool 108.

Each end of the device has an inner and outer magnet arrays, each with twelve neodymium magnets.

The proximity of the inner and outer arrays creates a very strong magnetic field therebetween.

A conductive cylinder goes in the gap, fixed to the common shaft. An eddy current is induced when the conductive material moves in the magnetic field, creating a force opposing. This provides the damping force for the device. The conductive ring also has a hub to locate it and fix it to the shaft and provide the damping torque.

A retraction spring 110 is located adjacent the spool 108 and is also mounted in the shaft 101. The spring 110 is sandwiched between two thin disks to reduce friction and noise when in use. In some embodiments the disks may be formed from a plastic material. The retraction spring 110 provides a biasing force to maintain the spool in a retracted position. That is, in use, when the spool is loaded with webbing or similar such material, the spool is biased to maintain the webbing in a retracted position and resists extraction or extension of the webbing material off of the spool.

In a further embodiment (Figure 9), the spool 120 may be made of two parts: a flange attached to the spool core 121 about which webbing 122 or other flexible material is wrapped and a detachable flange. The webbing may be fitted over the core of the spool before fastening the second flange on. A pin 124 which is set parallel to the longitudinal axis of the shaft provides a drive dog to spool the webbing 122 onto the core 121 of the spool 120.

In a further embodiment, Figure 10 shows a cylindrical conductor 200 formed. Also shown is part of the body of a braking device of a further embodiment inner 202 and outer 204 magnetic arrays of neodymium magnets. Examples of neodymium or rare earth magnet types are N35, N42 and N52 magnets. The conductor 200 is sized and shaped to be fitted between the inner 202 and outer 204 magnetic arrays.

Figure 11 is a representation of a braking device with inner 202 and outer 204 cylindrical magnetic arrays

where the polarity of each magnet 206 is indicated as N (North) or S (South). The inner and out arrays are fixed with respect to one another. Each magnet 206 on the inner array 202 is located adjacent a magnet with the opposing polarity, as is each magnet 206 on the outer array 204. The magnets which are facing each other between the inner and outer arrays are also of opposite polarity. Magnetic force lines 208 are indicated between the magnets of opposing polarity. The opposing polarities of the magnets increase the magnetic strength in the braking device, which in turn increases the eddy current braking capacity of the device where the conductor moves relative to the fixed magnets.

EXAMPLE 3

In this example a third embodiment is described of the braking device 300 and an attachment feature 400.

Referring to Figures 12 to 28 a further embodiment of braking device 300 is shown. The device 300 comprises a kinematic control system being a braking mechanism 301 and a driven member being a shaft 302 inside the braking device 300 housing 305 that rotates on application of a force to the shaft 302. The braking mechanism 301 and shaft 302 are connected by a line 304 wrapped on or about the shaft 302 so that, when line 304 is drawn from the shaft 302 in a first direction F_1 corresponding to animal movement relative to the braking device 300, the braking mechanism 301 applies an opposing force F_2 to the shaft 302 to slow or brake the rate of pay out of line 304 from the shaft 302/braking device 300. The braking device 300 as shown has a cylindrical housing 305 with the line 304 extending to and from the cylindrical housing 305.

The line 304 in this embodiment may be a length of flexible material shown in the Figures as webbing. This webbing may attach to a rope (not shown).

The line 304 may be approximately 500mm to 2000m long although the length may vary by application, for example by animal (calf or steer) weight and speed, and operator/rider ability.

In this embodiment, line 304 wraps onto or pays out from the shaft 302 indirectly via a spool 306, the spool 306 located inside the braking device 300 cylindrical housing 305. The line 304 passes through a nozzle 307 located in an opening in the braking device 300 housing 305.

The braking force F_2 imposed by the braking mechanism 301 may be due to induction of an eddy current braking effect due to relative movement between electrically conductive material (conductor 308) in a magnetic field 309 or vice versa. Eddy current braking may be useful as it is a non-friction based braking method and it has a varied relationship i.e. faster pay out of line from the spool 306 may elicit a proportionally higher braking effect from the braking device 300 than a slower pay out of line 304.

Further, slow pay out of line 304 from the spool 306 may incur no braking effect from the braking device 300 since there is minimal eddy current generation at low pay out speed thus allowing the line 304 to pay out for inspection for example.

The braking device 300 shown in this embodiment resets to a starting condition automatically and repeatedly. This is done by the line 304, once extended and any pay out force F_1 removed, automatically retracting and winding back to the spool 306 of the braking device 300. This may be achieved using a spring 309 that is biased to retract line 304 back to the spool 306. The braking mechanism 300 also controls the rate of retraction by braking excessive retraction speed caused by the spring 309.

Best seen in Figures 15-18, the braking mechanism 301 comprises magnet 309 arrays on a stator portion 310 of the braking device 300 while the conductors 308 are linked to the shaft 302 and move during pay out of line 3-4 from the braking device 300. As noted elsewhere, the magnets 309 and conductors 308 may be swapped and the magnet(s) move relative to the conductor(s) (not shown) e.g. the stator is made from or comprises a conductor array and the shaft 302 comprises magnets.

In this embodiment, the braking device 300 comprises two concentrically arranged circular arrays formed from a first, radially innermost array (inner array 309a) and second, radially outermost array (outer array 309b), the magnets 309 of the first array 309a facing radially outward towards the magnets 309 of the second array 309b which correspondingly face radially inward towards the first array 309a.

The conductor 308 has a circular or tubular shape and the circular or tubular conductor 308 is arranged concentrically with the circular or tubular magnetic array 309a, 309b. The distance between the magnets 309 and conductors 308 at their closest point may be very tight tolerance e.g. approximately 0.5mm, to achieve a compact configuration.

To avoid or minimise loss of magnetic flux between the magnets 309 and conductors 308, the length of the conductors 308 is extended beyond the magnets 309 by approximately 3mm.

Figures 12-14 and 19-28 further illustrate an attachment feature 400 configured to link the braking device 300 to an anchor such as a saddle (not shown). The attachment feature 400 comprises a body 401 with a first attachment side 402 to link the attachment feature 400 to the braking device 300; and a second attachment side 403 to releasably link the attachment feature 400 to an anchor (not shown).

The first attachment side 402 has fingers 404 located about the top of the first attachment side 402 shaped to complement the shape of a pin or shaft 405 on the braking device 300. The fingers 404 are hook shaped and extend upwards and orthogonally away from the attachment feature 400 body 401.

The fingers 404 define an opening 406 generally parallel to the first attachment side 402 so that the finger 404 opening 406 is configured to locate a pin or shaft 340 of the braking device 300.

The first attachment side 402 also comprise openings 407 in the first attachment side 402 body 401 that align with openings 320 in the braking device 300 when the braking device 300 is fitted correctly to the attachment feature 400, the openings 407, 320 configured to receive a fastener 500 therethrough. The fastener 500 as shown is a pin that releasably fits into the openings 407, 320.

The second attachment side 403 comprises webbing 408 that extends from the body 401 of the attachment feature 400. The webbing 408 is stitched to a lower side support 409 of the second

attachment side 403 and at the other end configured to thread into a rotating shaft 410, the rotating shaft 410 located intermediate the opposing sides 407, 320 of the body 401. An open end of the webbing 408 is threaded onto or through the shaft 410 and, as the shaft 410 rotates, webbing 408 is wound onto the shaft 410.

- 5 The attachment feature 400 has a stop member in the form of a latch or pawl 411 biased to interfere with a complementary rack notch or opening 412 and prevent lengthening rotation of the rotating shaft 410 i.e. only allows tightening or one way rotational movement. Reverse movement and untightening of the webbing 408 may only be possible by physically moving the pawl 411 against the bias e.g. by hand, to the move the pawl 411 away from the rack 412 and allow reverse movement of the rotating shaft 410.
- 10 The webbing 408 shown wraps about an anchor (not shown in Figures 12-28) to link the attachment feature 400 to the anchor e.g. a saddle or part of a saddle (not shown).

The attachment feature 400 may further comprise a removeable insert 600 best seen in Figures 22, 25 and in isolation in Figures 33-35. The removable insert 600 may be configured to accommodate on one side 601 the shape of the attachment feature 400 and on the opposing side 602, has a shape that

- 15 substantially conforms to the anchor shape such as a saddle or saddle part where the anchor is a saddle. The removable insert 600 as illustrated may be a pad or cushion manufactured from a solid or semi-solid material, optionally with some degree of resilience so as to comply with contours on the anchor and therefore assist in creating a firmer connection.

The removable insert 600 may be formed from one or multiple parts. The removable insert 600 part or parts can be manually disengaged from one another by for example simple releasable fastening device or clipping arrangements.

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EXAMPLE 4

The use of the braking device 700 is illustrated further in Figures 29-32 in a rodeo calf roping event with a mounted rider 701 pursuing and capturing a running calf 702. Figure 29 shows the braking device 700 of Example 3 attached to a horse 703 saddle 704 in a rodeo setting, the rider 701 about to lasso rope a calf 702; Figure 30 shows the rider 701 capturing the calf 702 via the lasso rope 705 and the horse 703 beginning to brake, the rope 705 not yet tensioned; Figure 31 shows a side image of the rope 705 now in tension, the braking device 700 now acting to slow calf 702 movement relative to the anchor (the saddle 704 on the horse 703); and Figure 32 shows a side image of the rope 705 fully tensioned and relative calf 702 movement now stopped.

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The calf 702 is captured by the rope 705 which is attached to the braking device 700. As the horse 703 is trained to stop when the calf 702 is roped, the rope 705 tightens against the running calf 702. The proximal end of the rope 705 is attached to the webbing retaining within the spool of the device 700. As the rope 705 is pulled, so too is the webbing from the device 700 as it rotates the spool and the

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conductors . The braking effect of the eddy current force acts to slow the rotation of the spool which in turn slows the calf 702 as the webbing spools out against the eddy current force before coming to a stop at the end of the length of the webbing. The reduction in speed of the calf 702 caused by the braking force prior to the full stop is enough to substantially reduce the likelihood of harm or injury to the calf

5 702.

Aspects of the device, attachment feature, methods and uses thereof 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 of the claims herein.

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WHAT IS CLAIMED IS:

1. A braking device for controlling the movement of an animal attached thereto, the device comprising:
 - at least one kinematic control system;
 - 5 at least one driven member,
 - wherein the kinematic control system and at least one driven member are operatively connected such that when a first force is applied to the driven member in a first direction corresponding to animal movement relative to the braking device, the kinematic control system applies a second force to the driven member in a second direction which counteracts the first force applied to the driven member.
- 10 2. The braking device as claimed in claim 1 wherein the kinematic control system is a brake mechanism that slows or halts shaft first direction rotation movement by applying the second force on the shaft in a second direction opposite to the first direction.
3. The braking device as claimed in claim 1 or claim 2 wherein the braking device driven member and an animal to be controlled are in use operatively connected via a line and wherein the line extends and retracts from and to the braking device, line extension and retraction being relative to animal movement when an animal is connected to the braking device and moving relative to the braking device.
- 15 4. The braking device as claimed in claim 3 wherein the line is provided with an attachment means at the distal end thereof for attachment to rope or cable.
- 20 5. The braking device as claimed in claim 3 or claim 4 wherein the line is approximately 500mm to 2000m long.
6. The braking device as claimed in any one of claims 3 to 5 wherein the line wraps onto the driven member via a receiving element directly or indirectly linked to the driven member.
- 25 7. The braking device as claimed in claim 6 wherein the receiving element is a drum or spool configured to rotate to pay out or receive line.
8. The braking device as claimed in any one of claims 3 to 7 wherein, when the first force is applied to the braking device, line extension occurs prior to further line extension halting.
9. The braking device as claimed in any one of claims 3 to 8 wherein the braking device is configured to reset to a starting retracted position automatically and repeatedly so that, once an extending force is removed from the line, the line then re-sets by retracting line back to the braking device.
- 30 10. The braking device as claimed in any one of the above claims wherein the second force is provided by a braking mechanism, the braking mechanism selected from: frictional means, biasing means, magnetic means, and combinations thereof.

11. The braking device as claimed in claim 10 wherein the magnetic means is an eddy current braking force caused by relative movement between an electrical conductor and a magnet field.
12. An attachment feature configured to link a braking device to an anchor, the attachment feature comprising:
- 5 a body with:
- a first attachment side to link the attachment feature to the braking device; and
- a second attachment side to releasably link the attachment feature to the anchor.
13. The attachment feature as claimed in claim 12 wherein the body comprises two opposing plates and supports therebetween, the supports defining a width of the body, the plates at a first attachment
- 10 side have a shape that complements the outer shape of the braking device or a part thereof and the plates at a second attachment side have a shape that complements the shape of the anchor or a part thereof.
14. The attachment feature as claimed in claim 12 or claim 13 wherein the first attachment side comprises:
- 15 a first portion comprising one or more finger features shaped to complement the shape of a pin or shaft on the braking device and,
- a second portion comprising openings in the first attachment side body that are configured to align with openings in the braking device or a part thereof when the braking device is fitted correctly to the attachment feature, the openings configured to receive a fastener therethrough.
- 20 15. The attachment feature as claimed in any one of claims 12 to 14 wherein the second attachment side comprises:
- webbing, the webbing at one end attached to a first portion of the second attachment side and at the other end configured to thread into a tightening means, the tightening means located on the second attachment side at a second portion, the distance between the first and second portions
- 25 defining a length of webbing for connection to the anchor and the webbing extending outwardly from the body of the attachment feature.
16. The attachment feature as claimed in claim 15 wherein the first portion of the second attachment side is a first support and the webbing is permanently stitched onto the first support and, the second portion of the second attachment side is a second support that acts as a tightening means and the
- 30 webbing is releasably attached to the second support.
17. The attachment feature as claimed in claim 16 wherein the second support is a rotating shaft intermediate the opposing side plates of the body, wherein the open end of the webbing is threaded onto or through the shaft and, as the shaft rotates, webbing is wound onto the shaft.
18. The attachment feature as claimed in claim 16 or claim 17 wherein the attachment feature further

comprises a stop member, the stop feature being biased to cause the second support to only allow the tightening means to reduce the webbing length relative to the first portion and prevent lengthening of the webbing between the first portion and second portion.

19. The attachment feature as claimed in claim 18 wherein the stop member is a latch or pawl biased to interfere with a complementary notch or opening on the tightening mechanism and prevent lengthening movement of the second portion or tightening mechanism, reverse movement and untightening of the webbing being affected by causing movement against the bias to the move the stop away from the second portion and allow reverse movement.
20. The attachment feature as claimed in any one of claims 12 to 19 wherein the anchor is a saddle or part thereof.
21. The attachment feature as claimed in any one of claims 12 to 20 wherein the attachment feature further comprises a removable insert configured to accommodate, on one side, the shape of the attachment feature and, on the opposing side, has a shape that substantially conforms to the anchor shape or part thereof.
22. A device configured to resist movement of an animal, the device comprising:
 - a braking device as claimed in any one of claims 1-11; and
 - an attachment feature as claimed in any one of claims 12-21.
23. A device configured to slow and then subsequently halt movement of an animal, the device comprising:
 - a braking device as claimed in any one of claims 1-11; and
 - an attachment feature as claimed in any one of claims 12-21.
24. A method of controlling the movement of an animal via the steps of:
 - selecting a braking device as claimed in any one of claims 1-11;
 - attaching the animal to the braking device; and,
 - wherein, when the animal has a greater relative speed than the braking device, movement of the animal is controlled by actuation of the braking device to resist further relative movement of the animal.
25. A method of reducing the speed of an animal prior to stopping movement of the animal by the steps of:
 - selecting a braking device as claimed in any one of claims 1-11;
 - attaching the animal to the braking device; and,
 - wherein, when the animal has a greater relative speed than the braking device, relative

movement of the animal is slowed and subsequently stopped by actuation of the braking device.

26. Use of the braking device as claimed in any one of claims 1-11 to resist movement, or to slow and subsequently halt movement, of an animal attached thereto.

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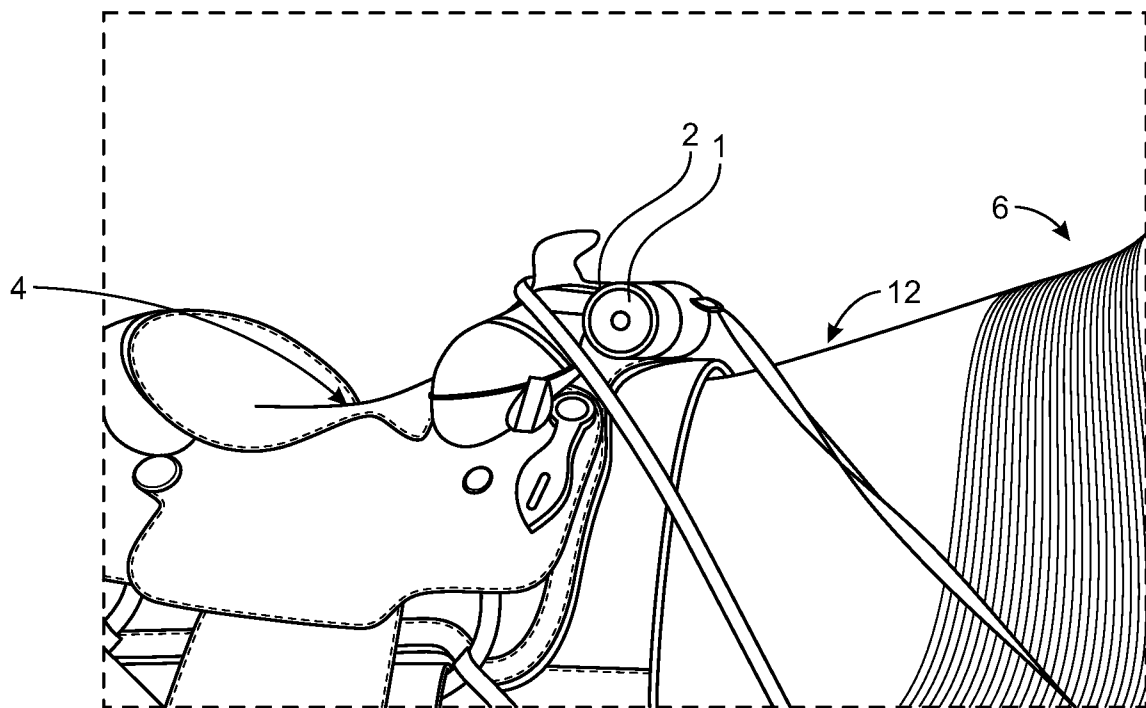


FIG. 1

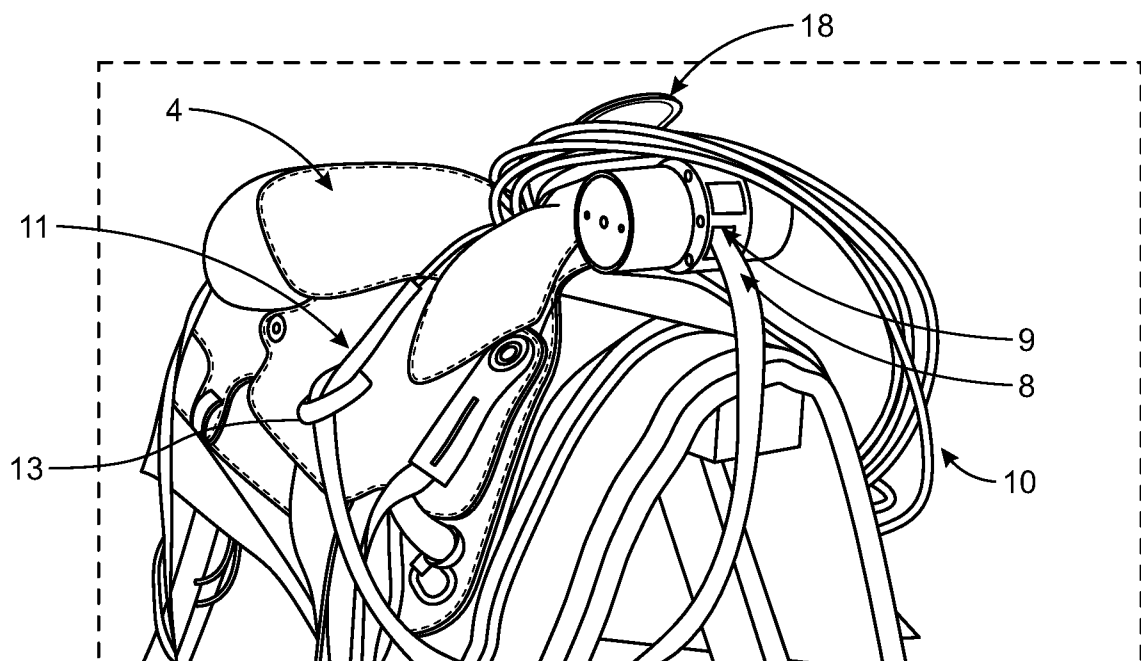


FIG. 2

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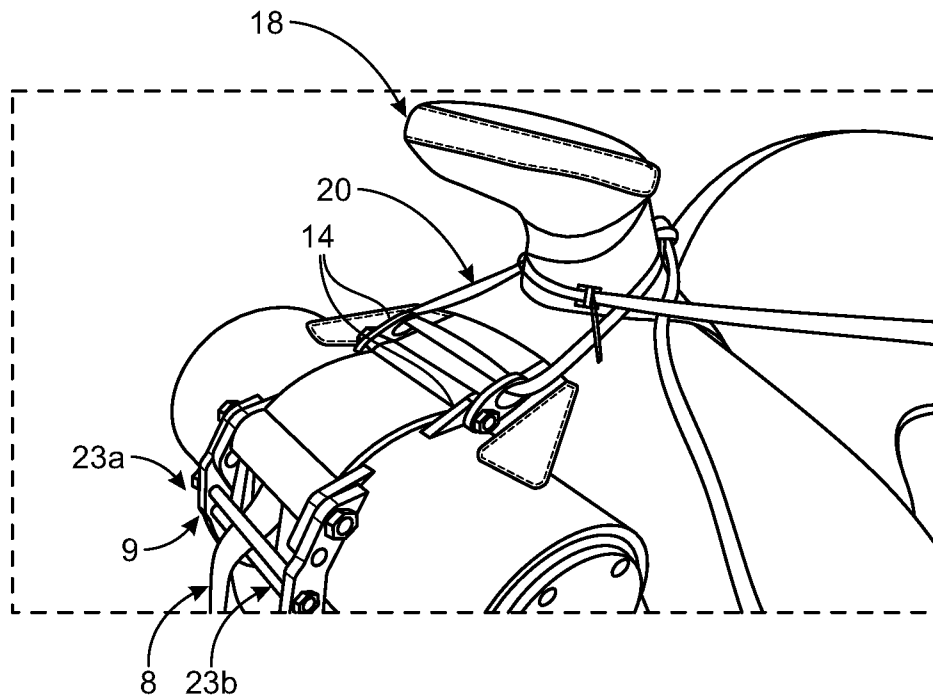


FIG. 3

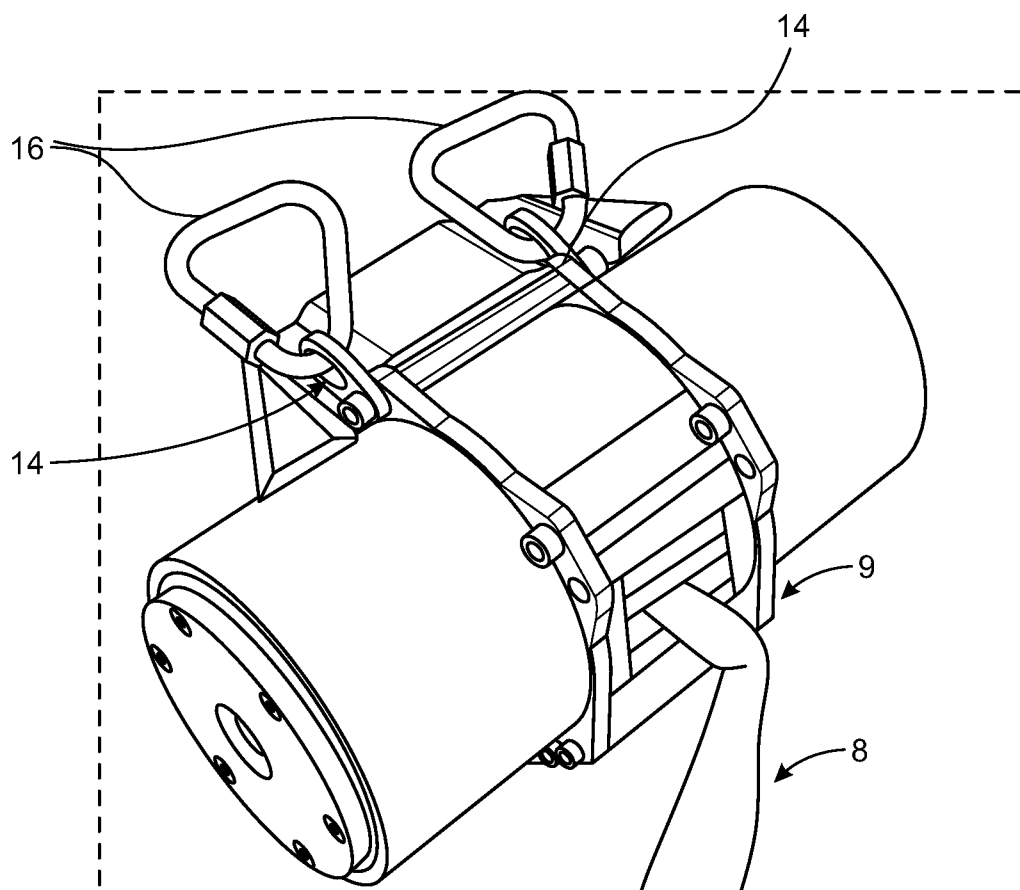


FIG. 4

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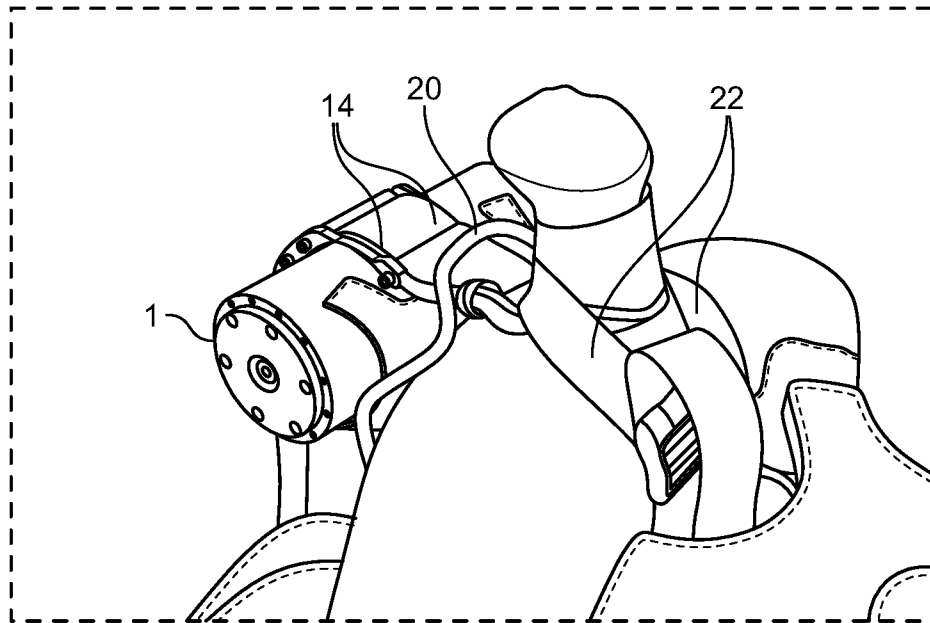


FIG. 5

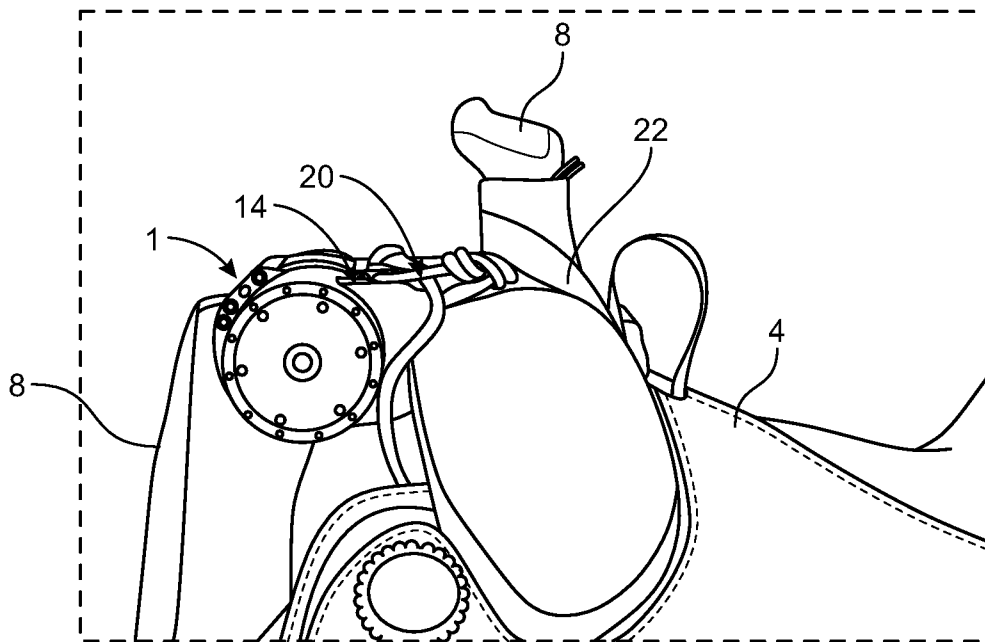


FIG. 6

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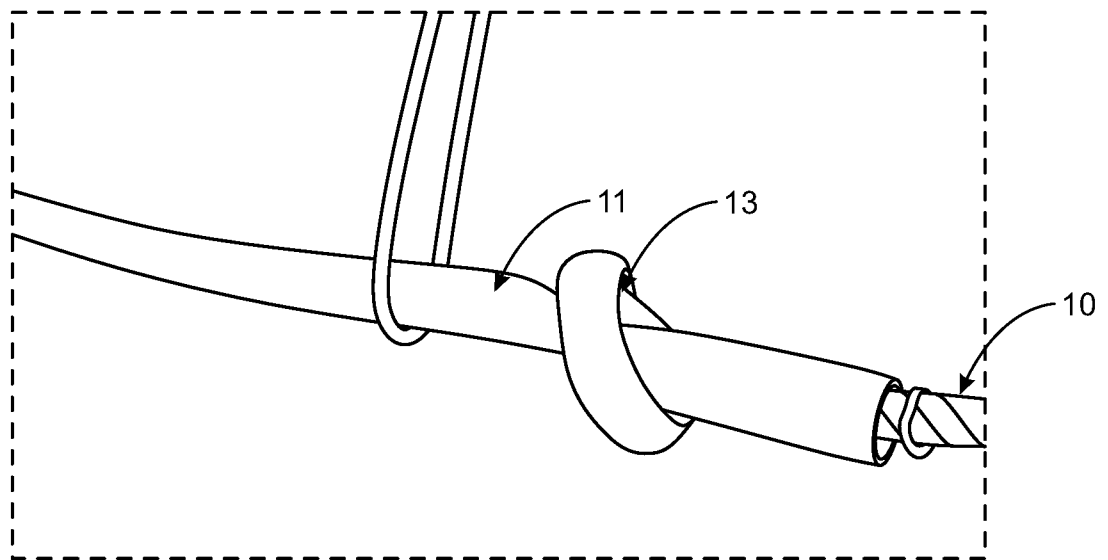


FIG. 7

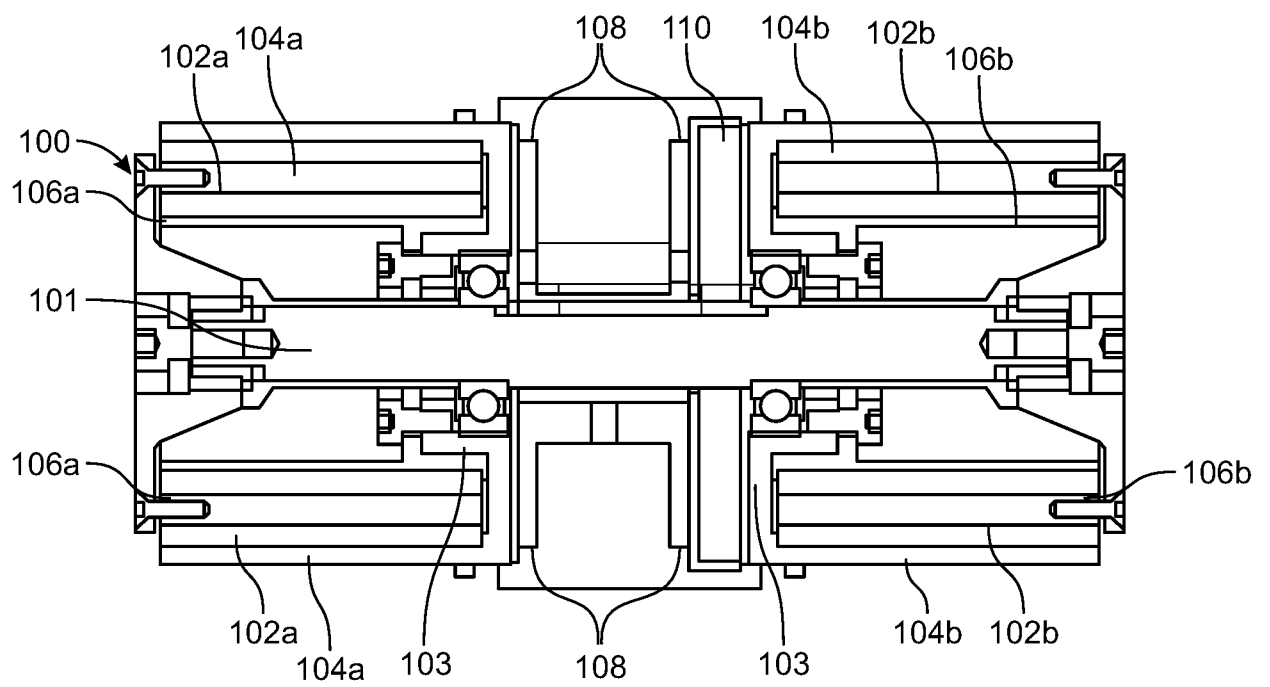


FIG. 8

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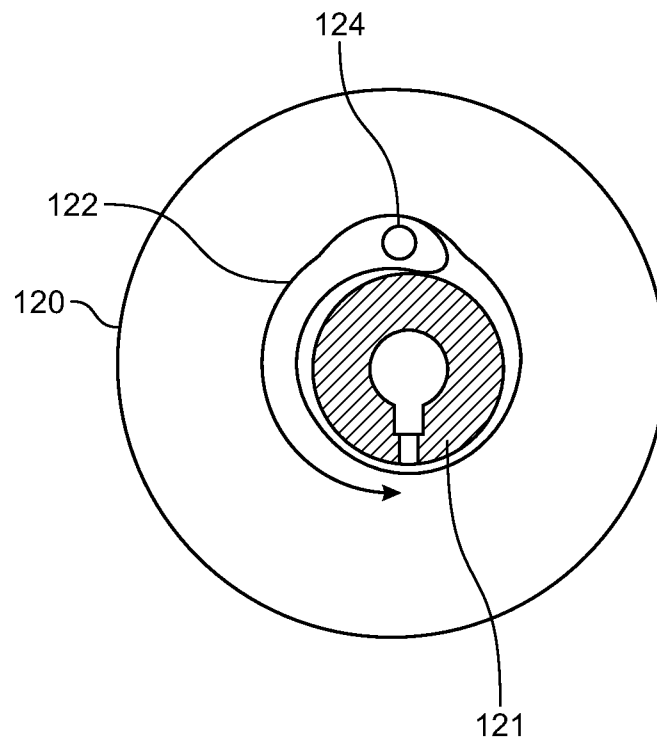


FIG. 9

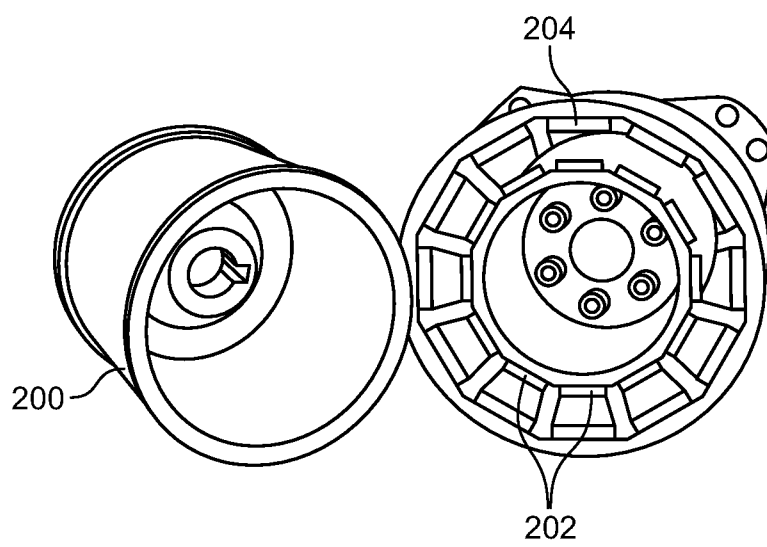


FIG. 10

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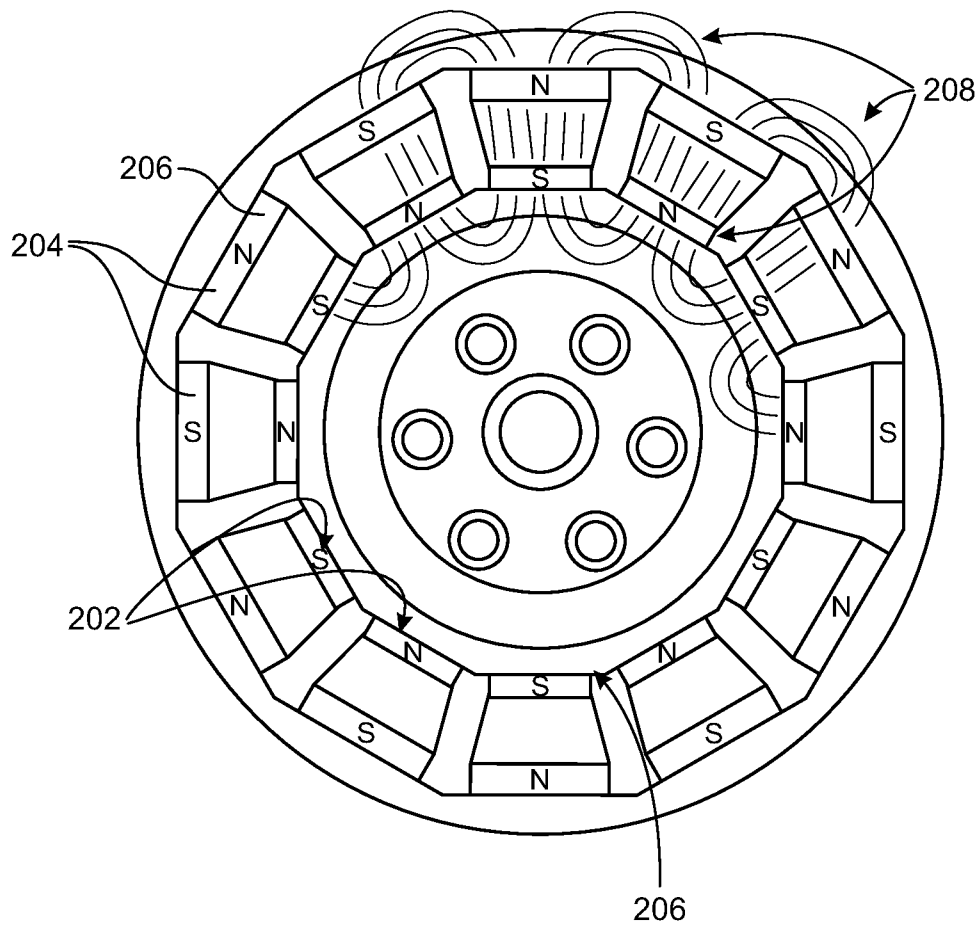


FIG. 11

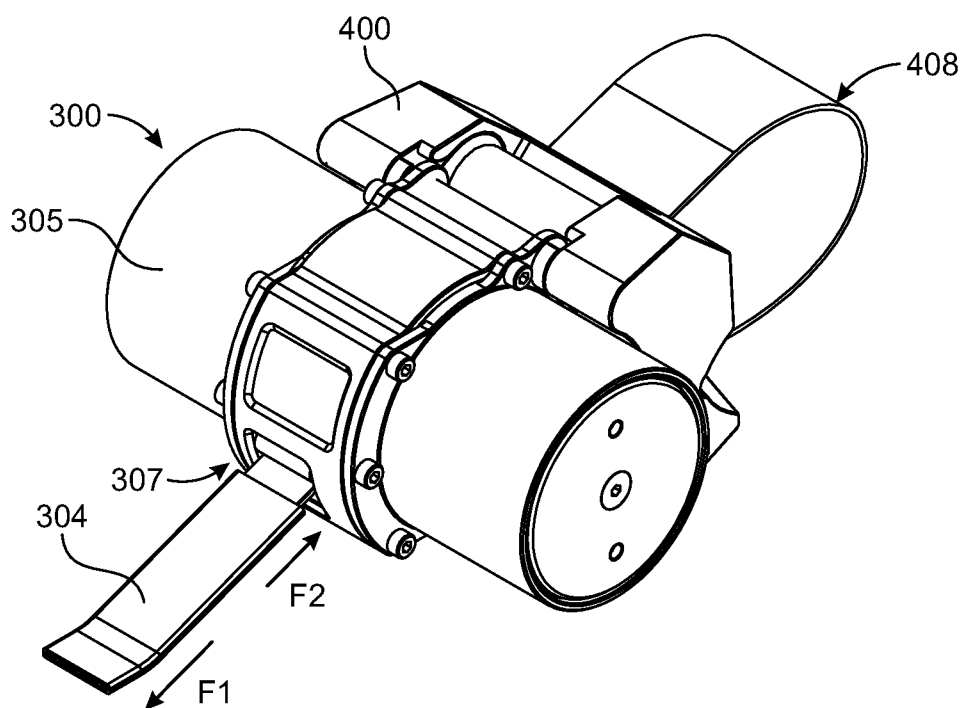


FIG. 12

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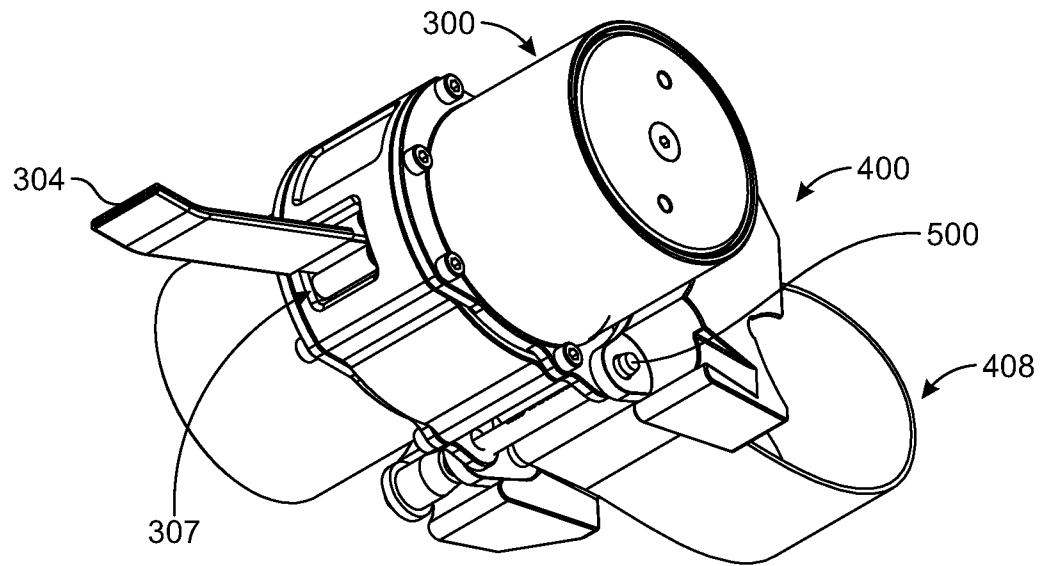


FIG. 13

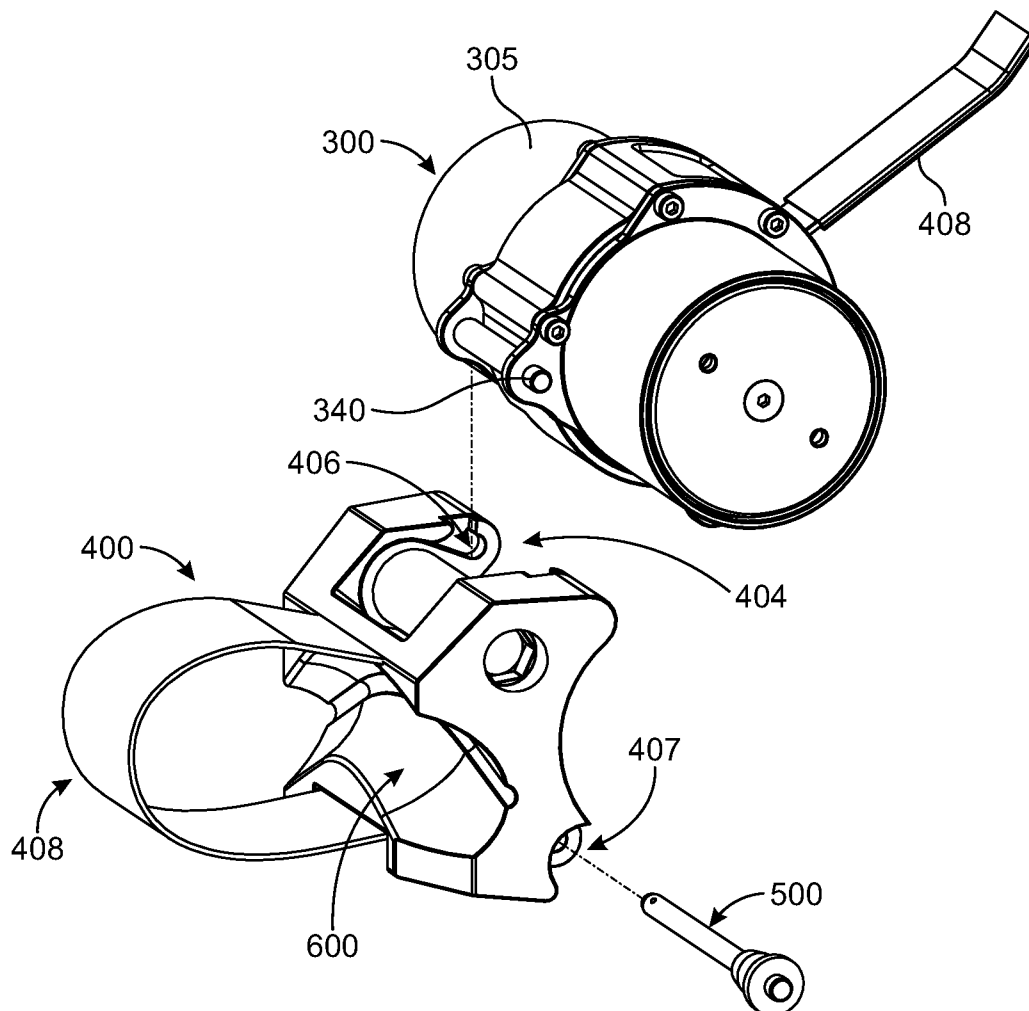


FIG. 14

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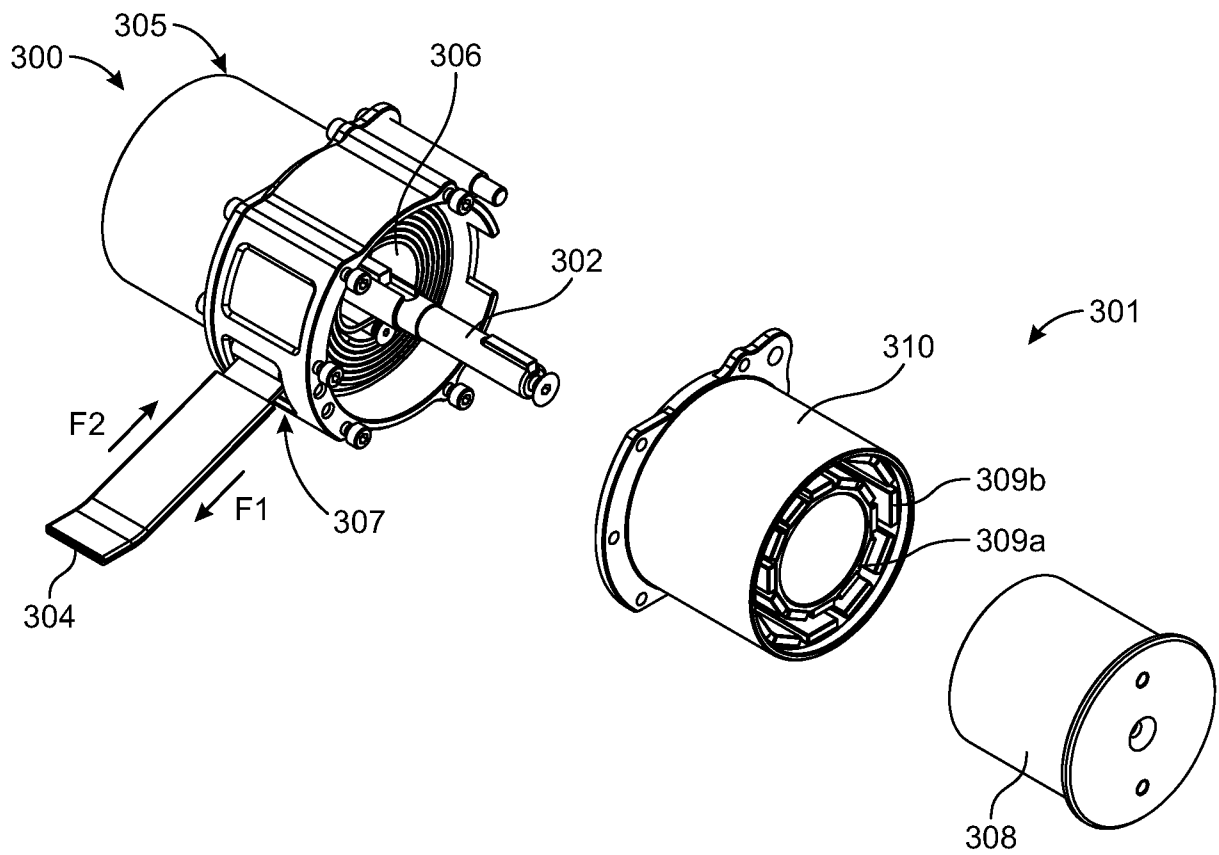


FIG. 15

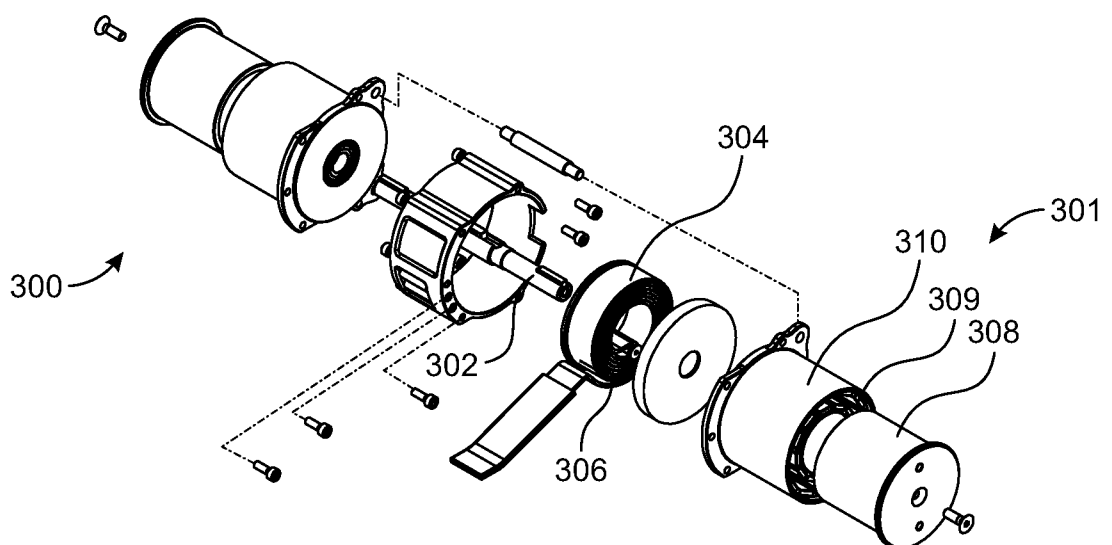


FIG. 16

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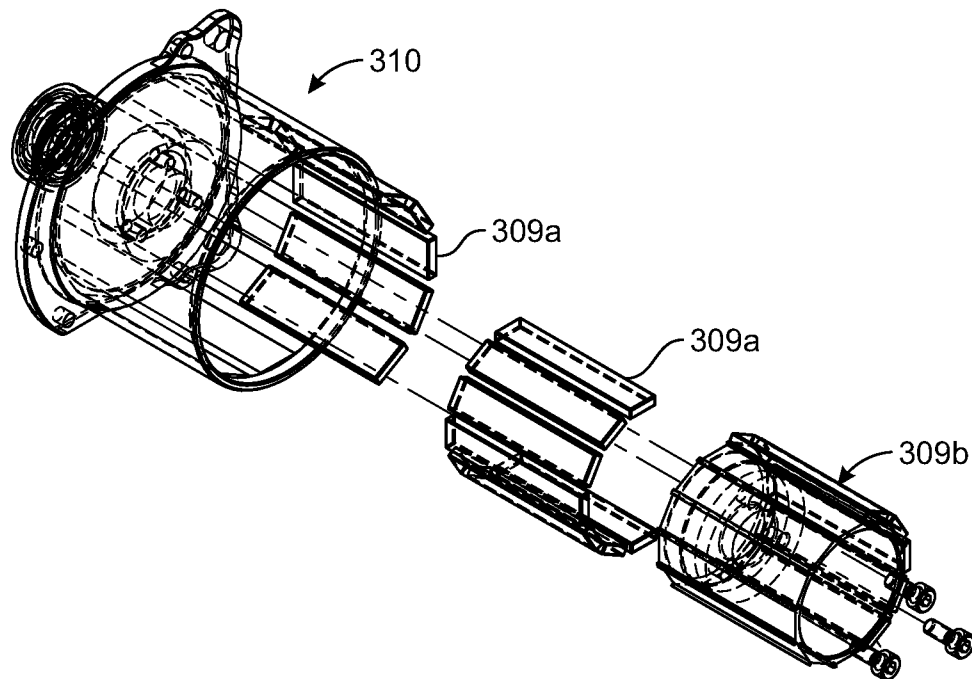


FIG. 17

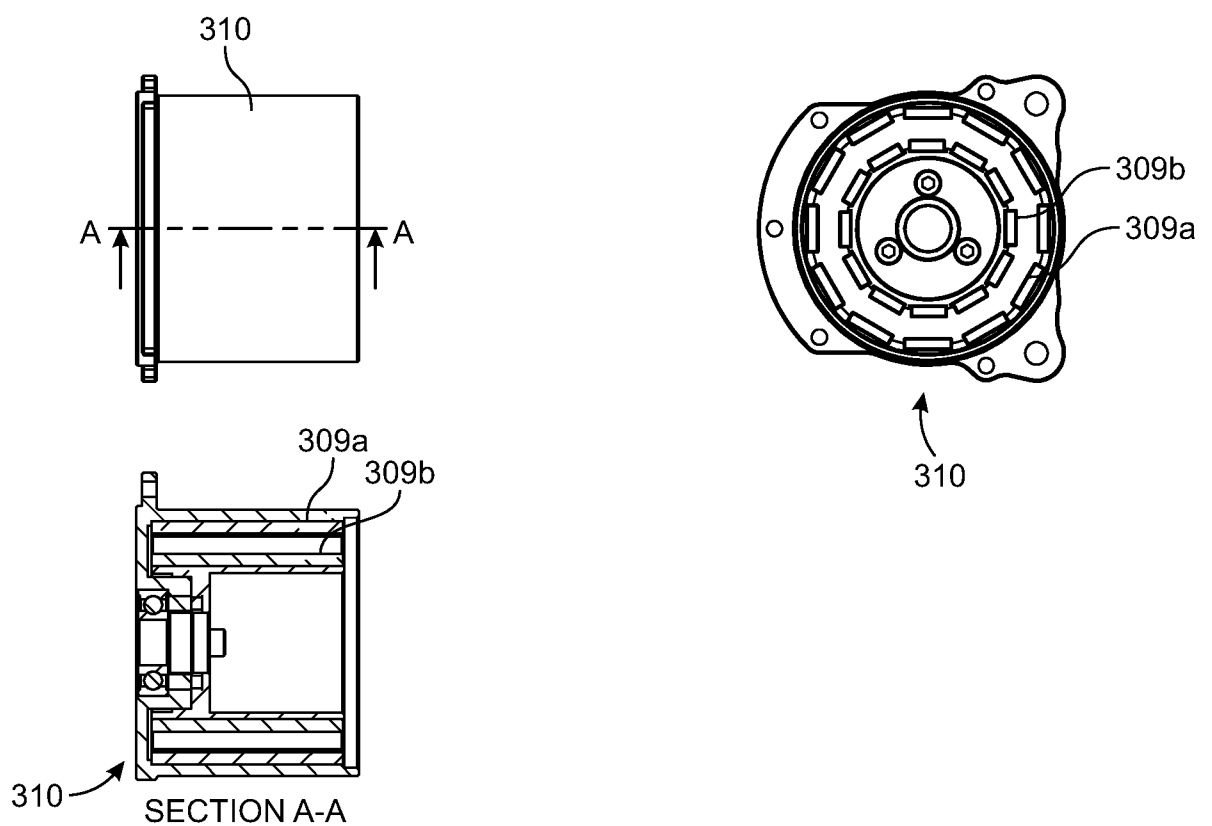


FIG. 18

SUBSTITUTE SHEET (Rule 26)

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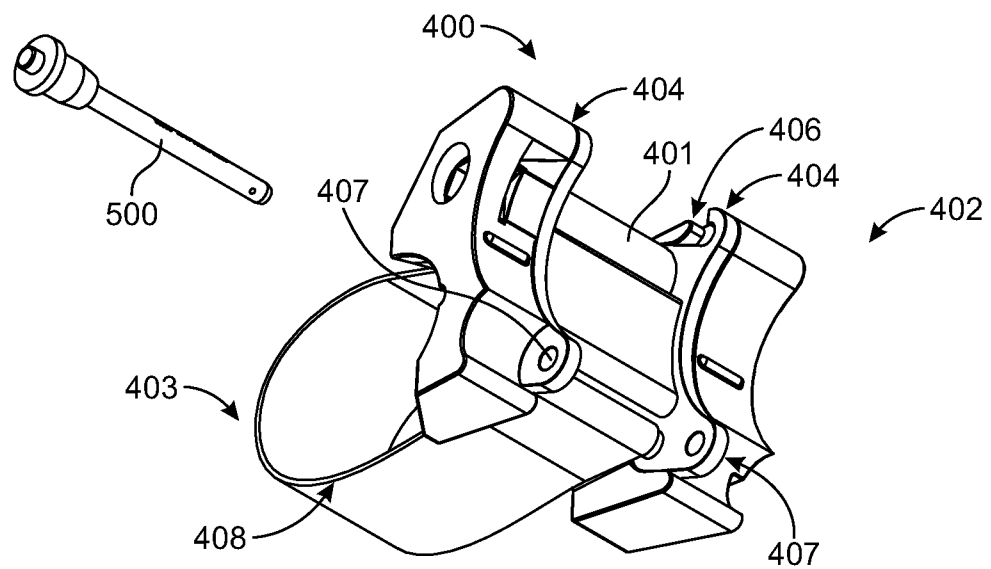


FIG. 19

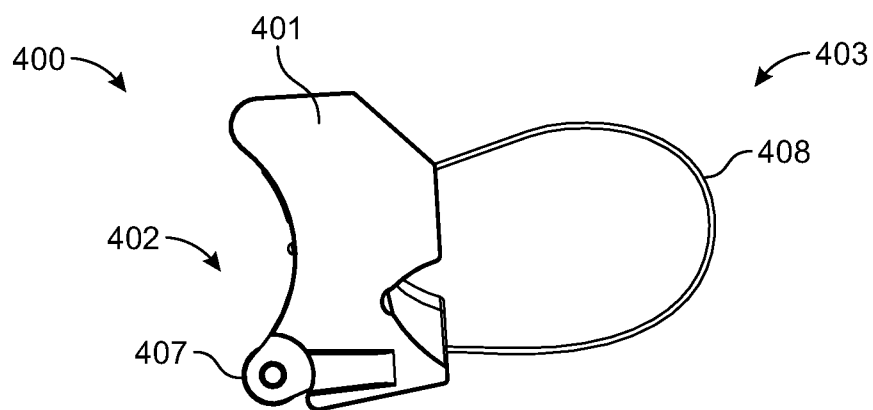


FIG. 20

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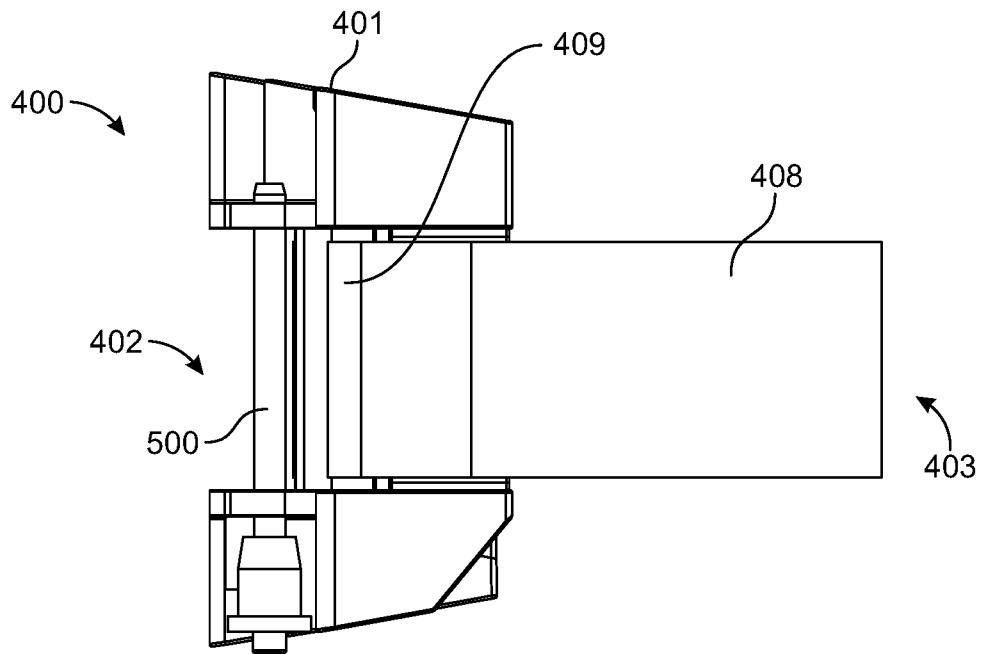


FIG. 21

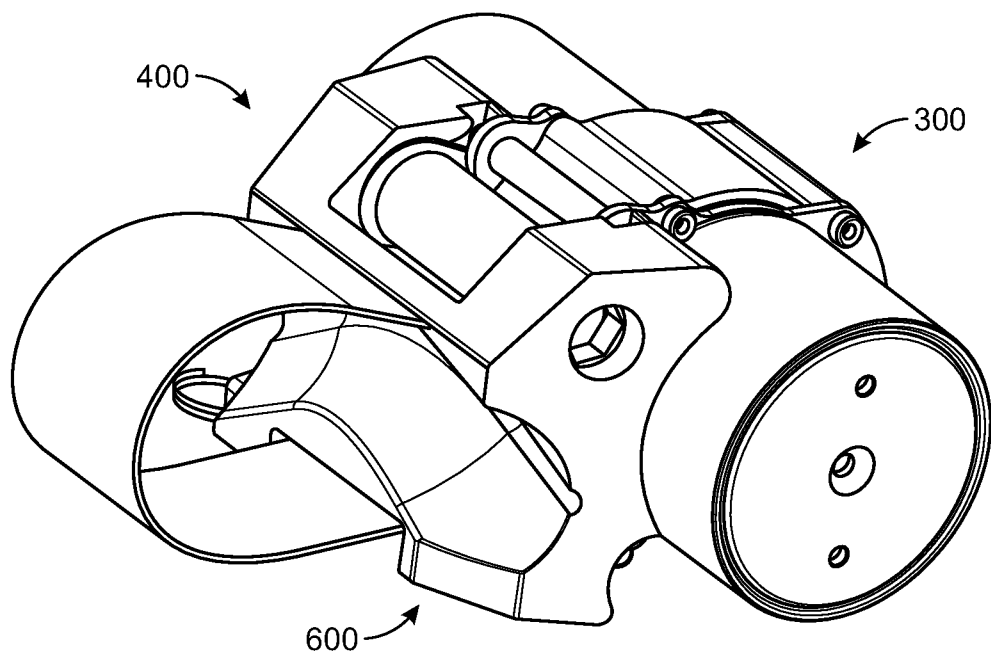


FIG. 22

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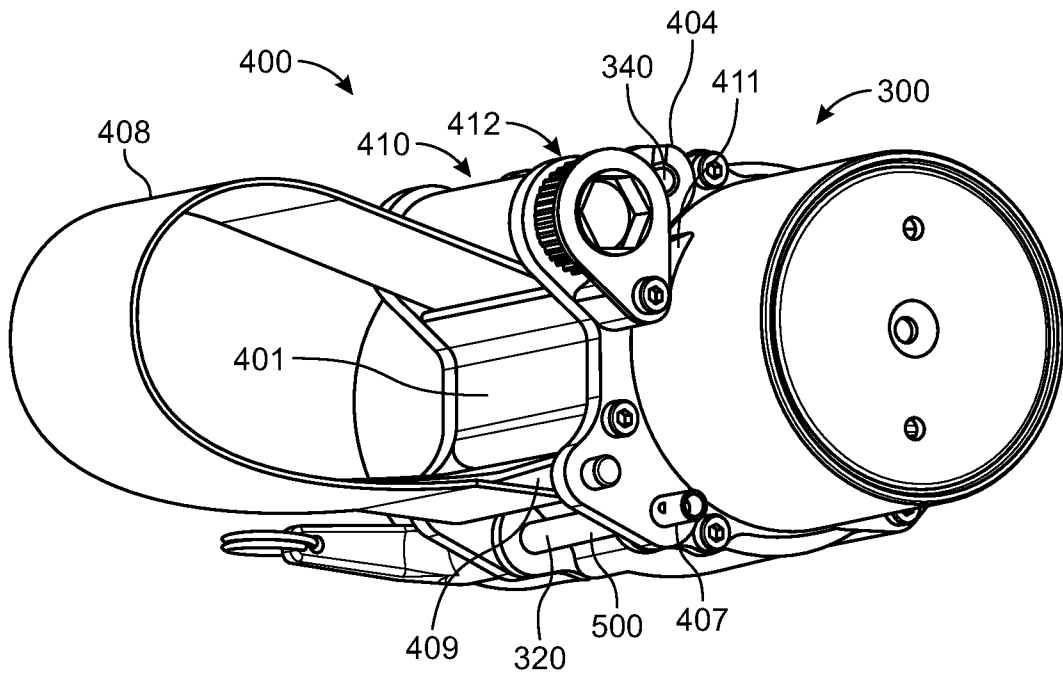


FIG. 23

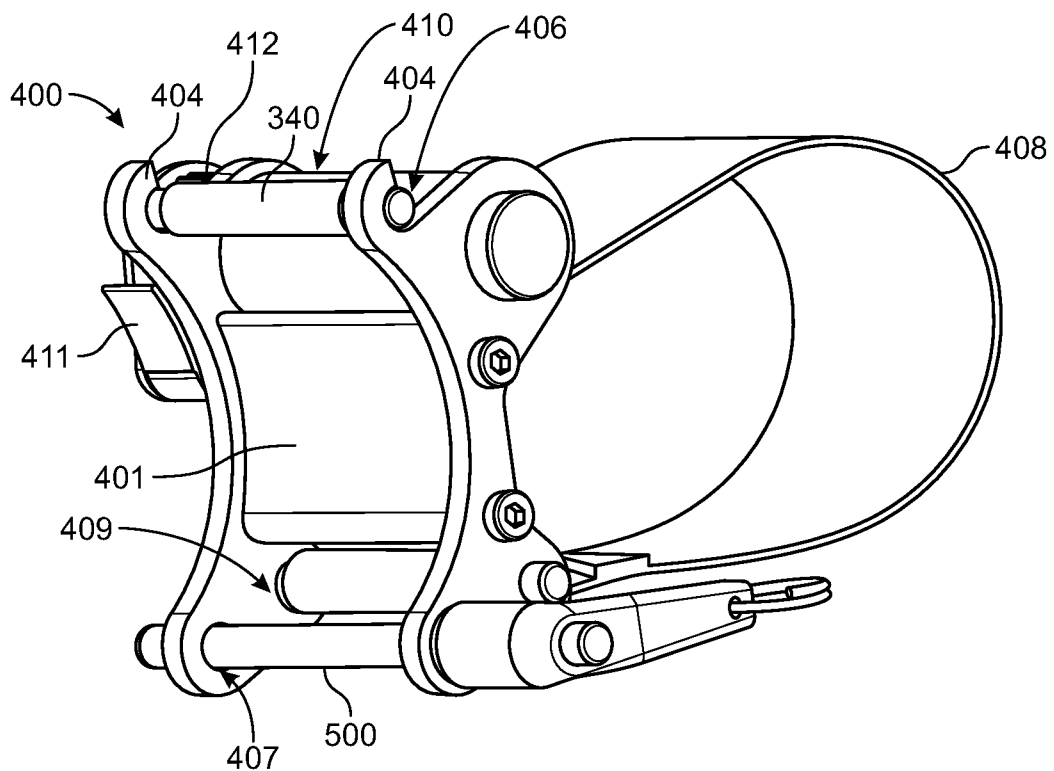


FIG. 24

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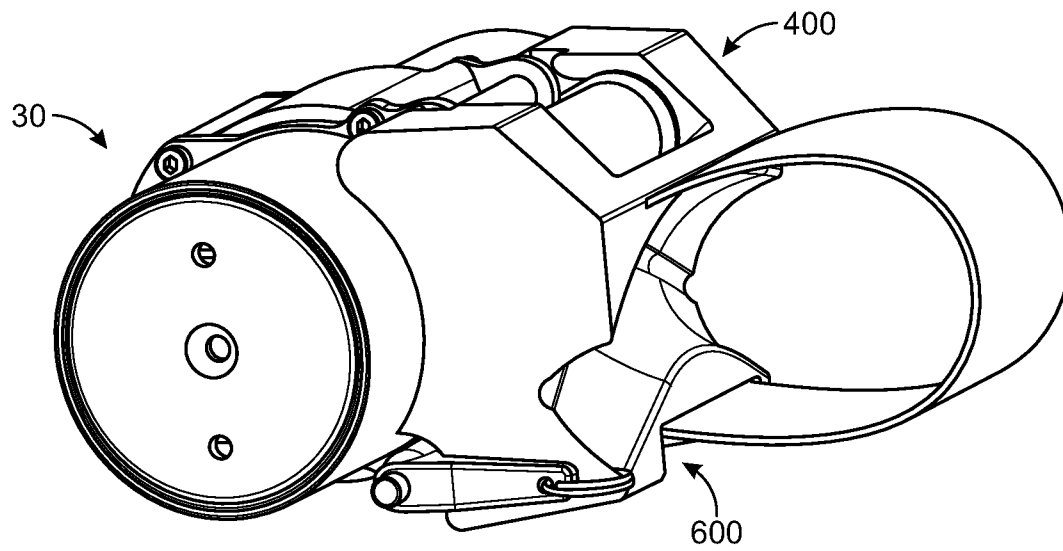


FIG. 25

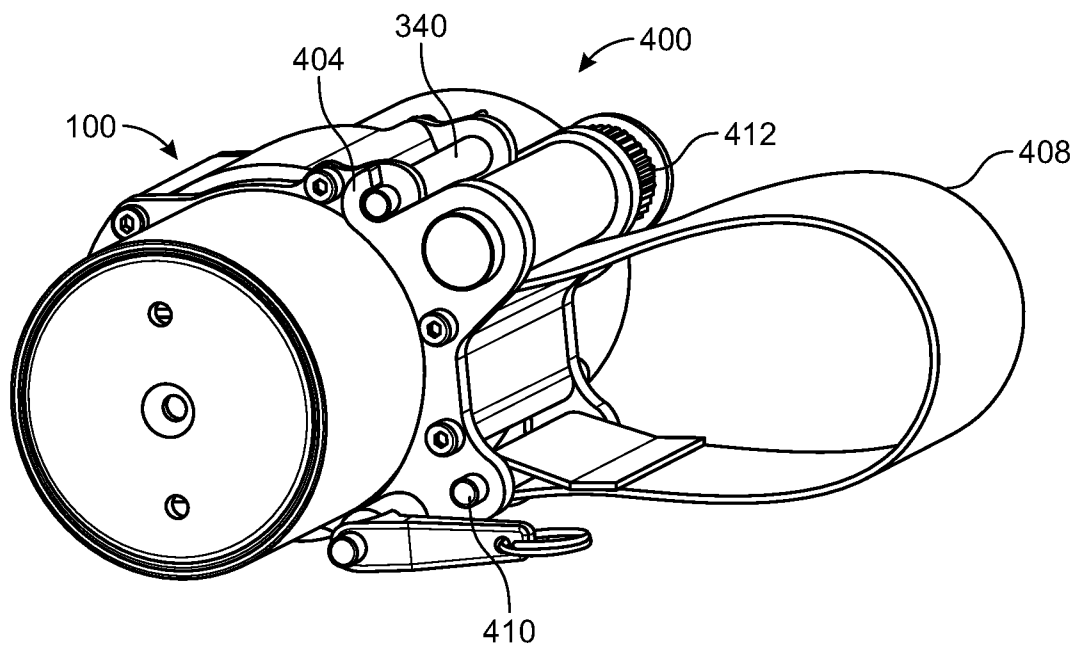


FIG. 26

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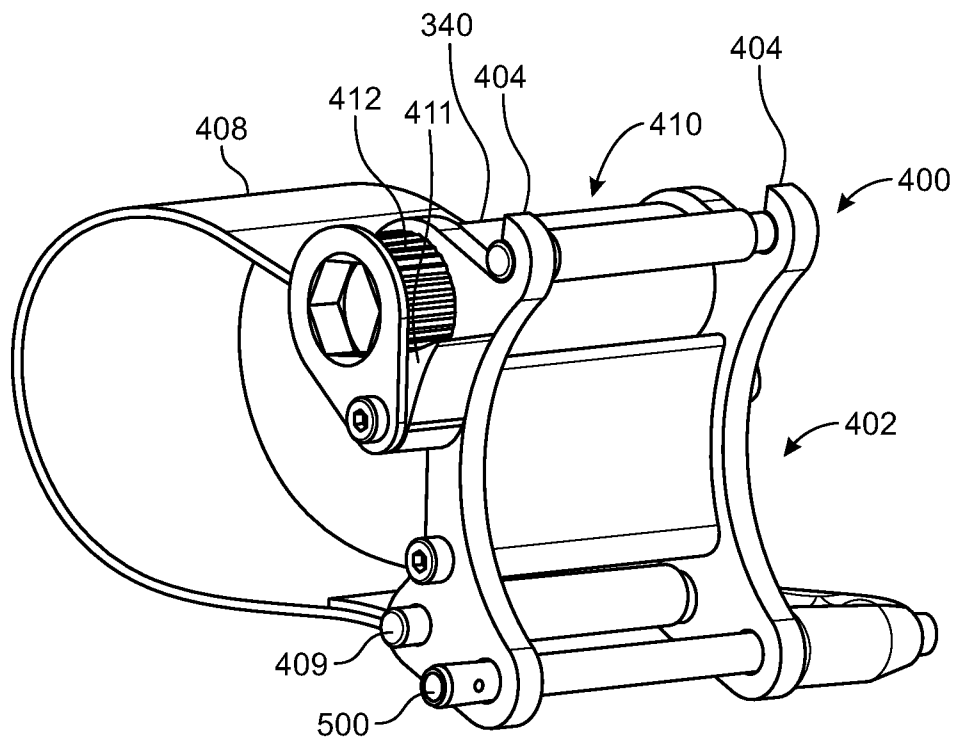


FIG. 27

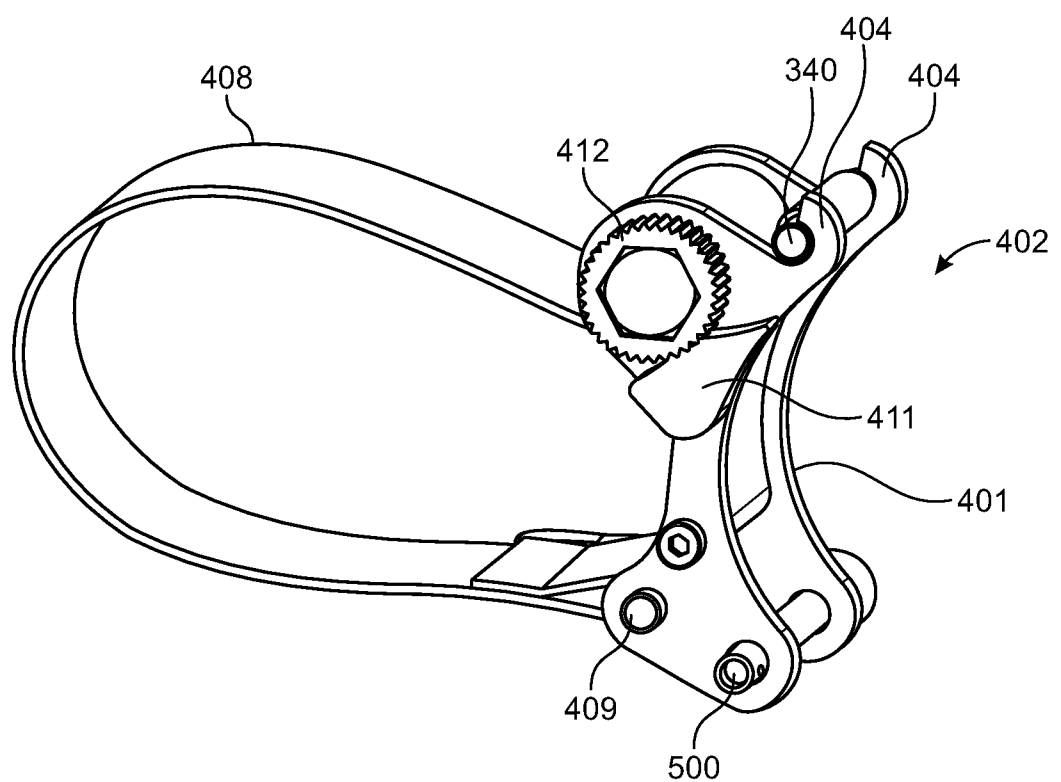


FIG. 28

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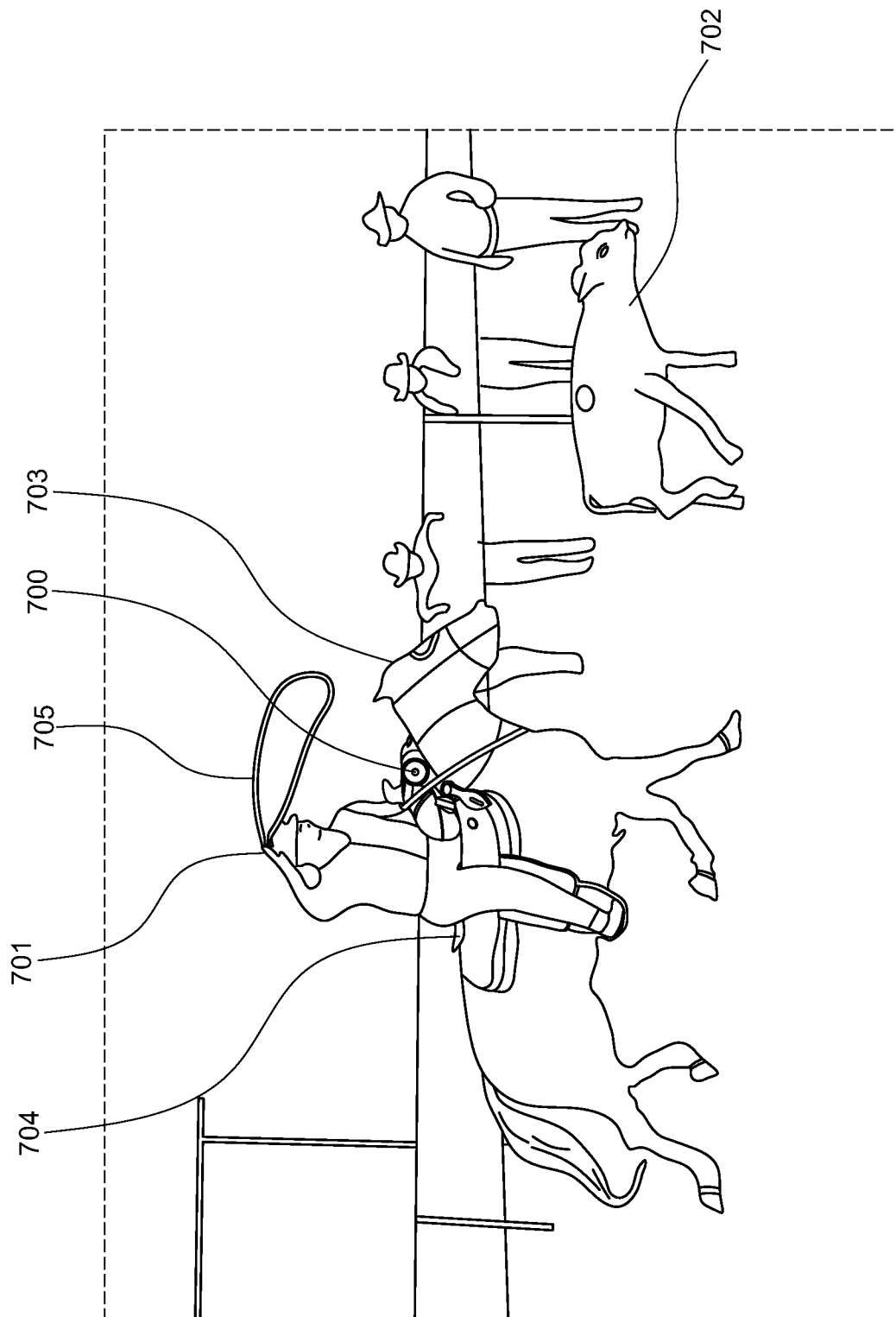


FIG. 29

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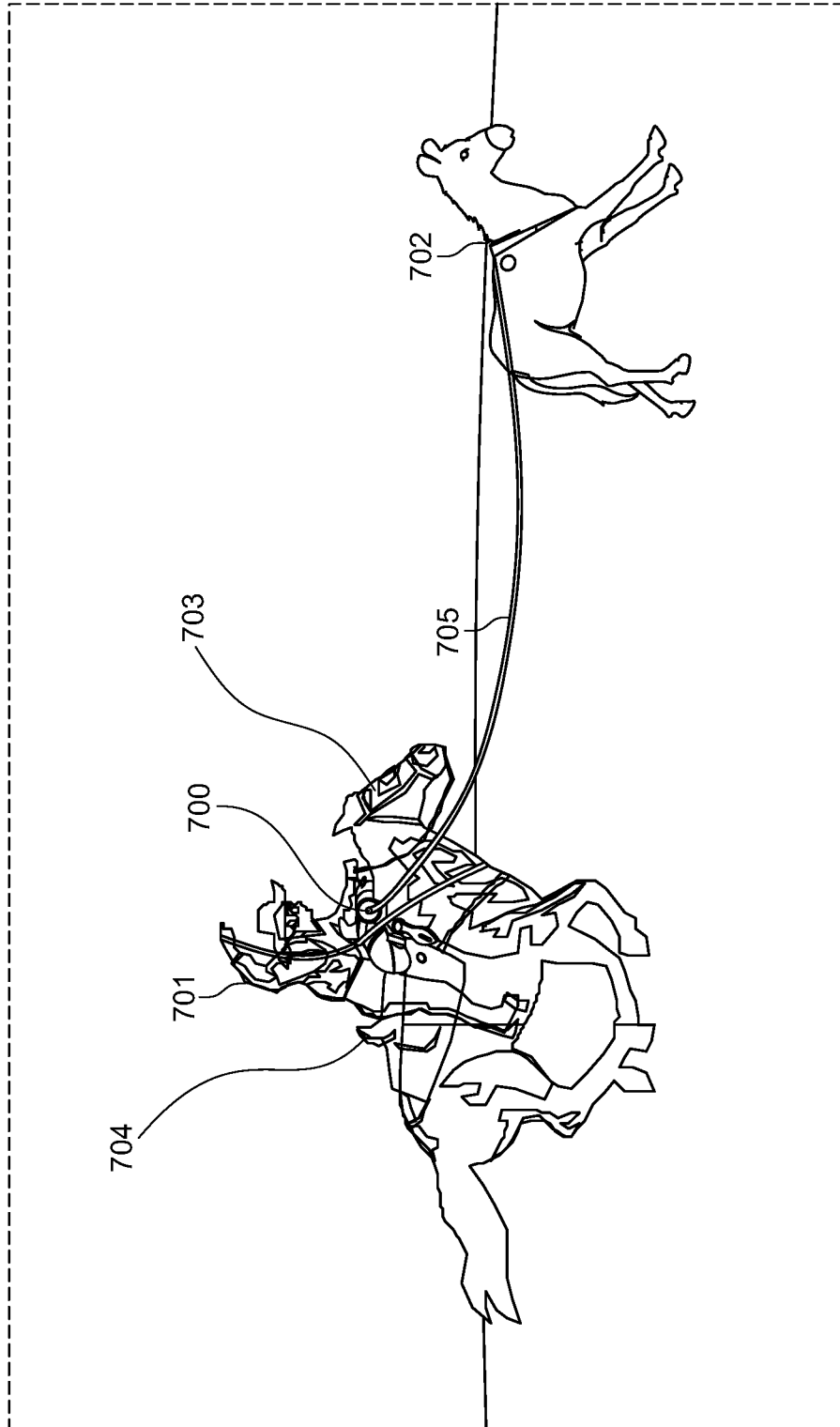


FIG. 30

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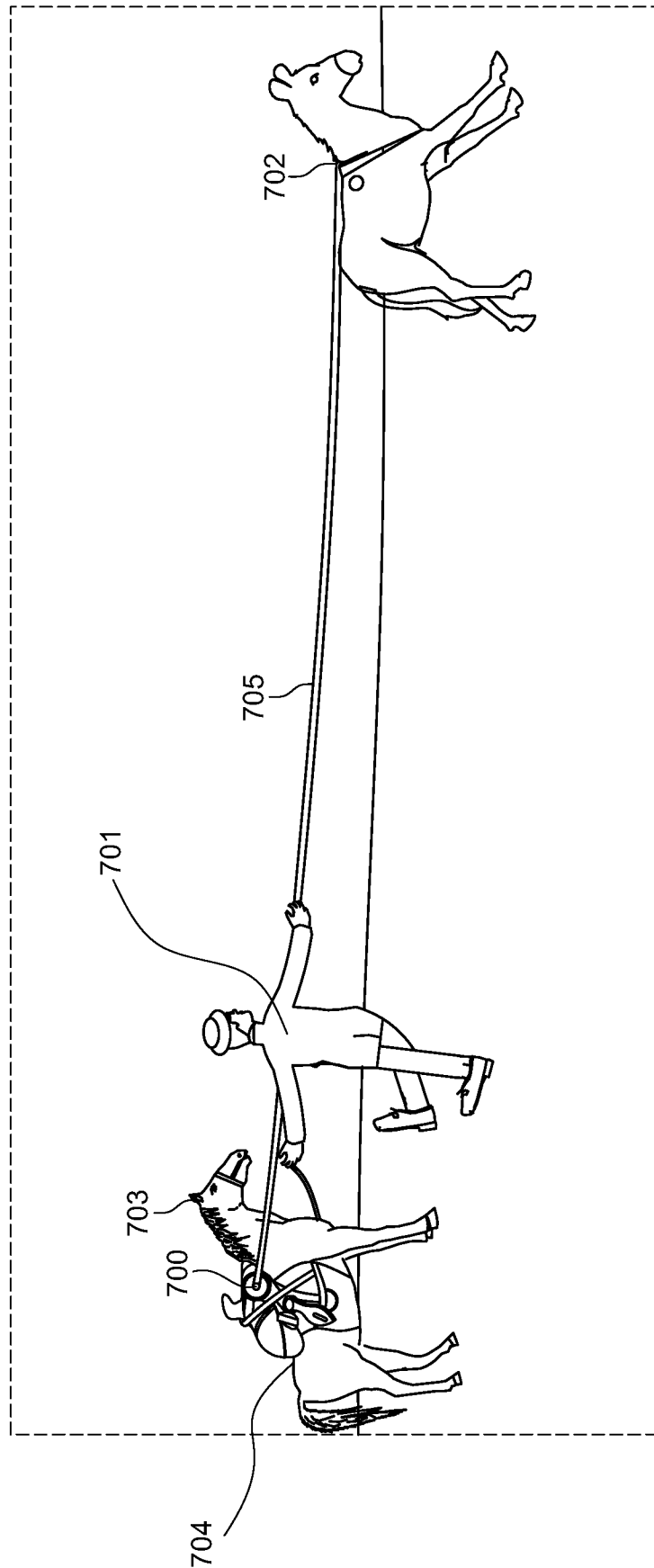


FIG. 31

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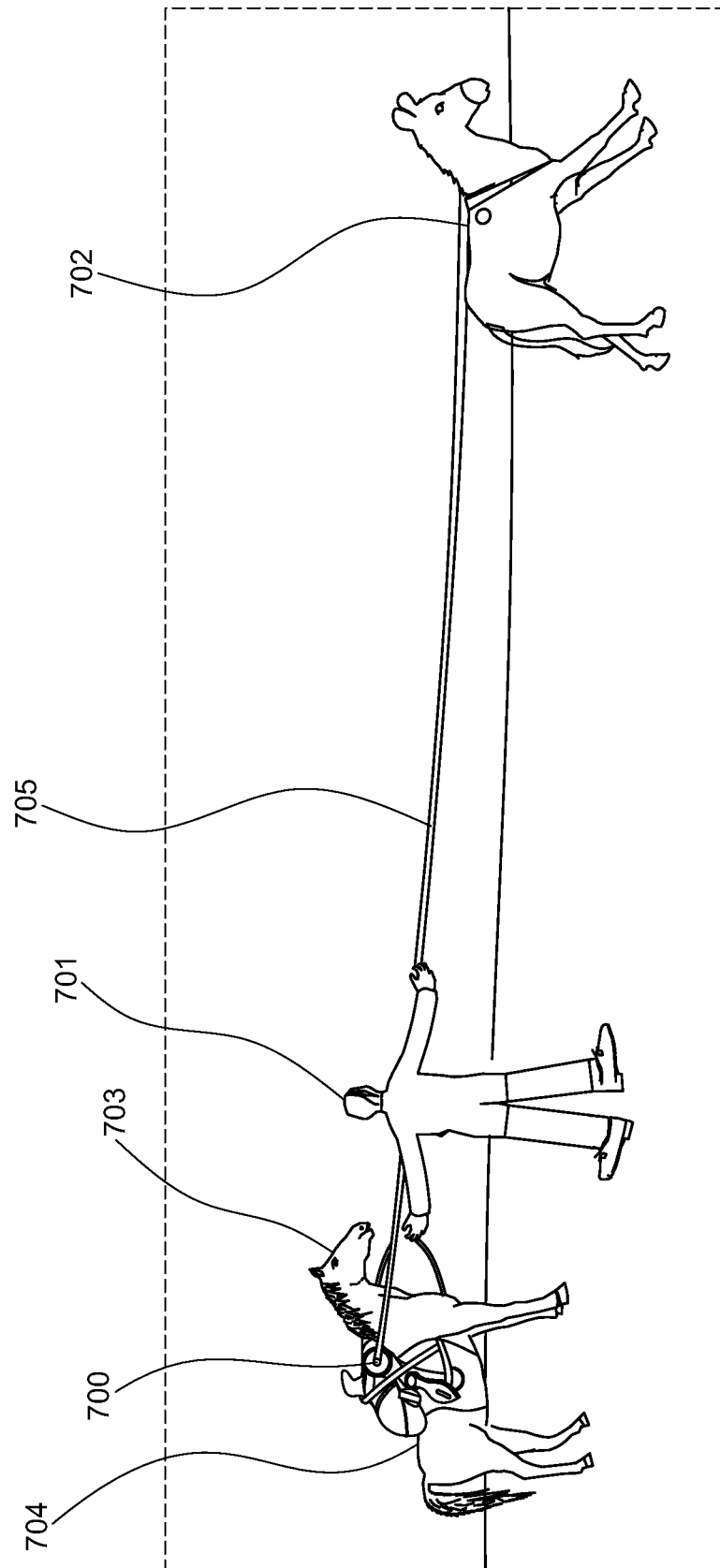


FIG. 32

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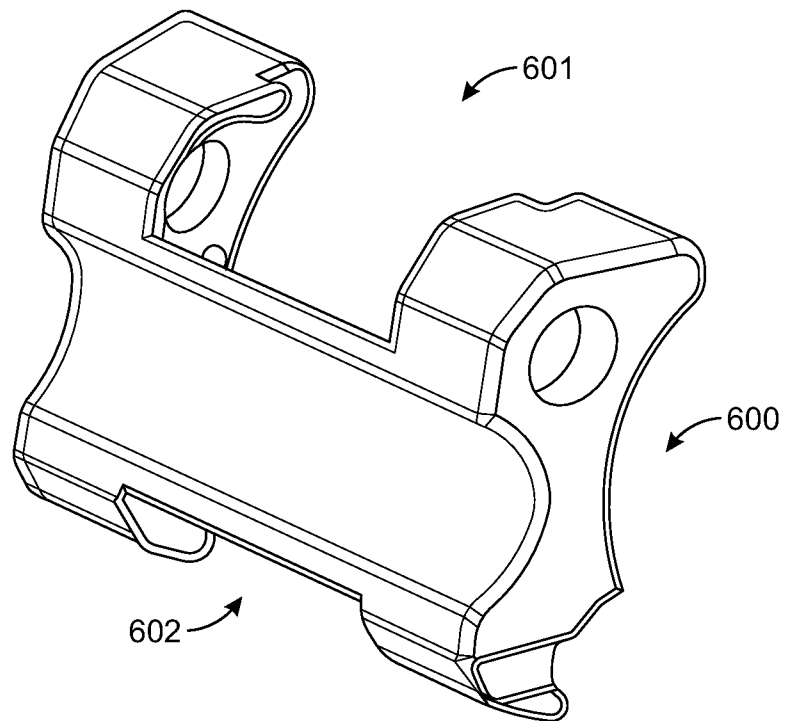


FIG. 33

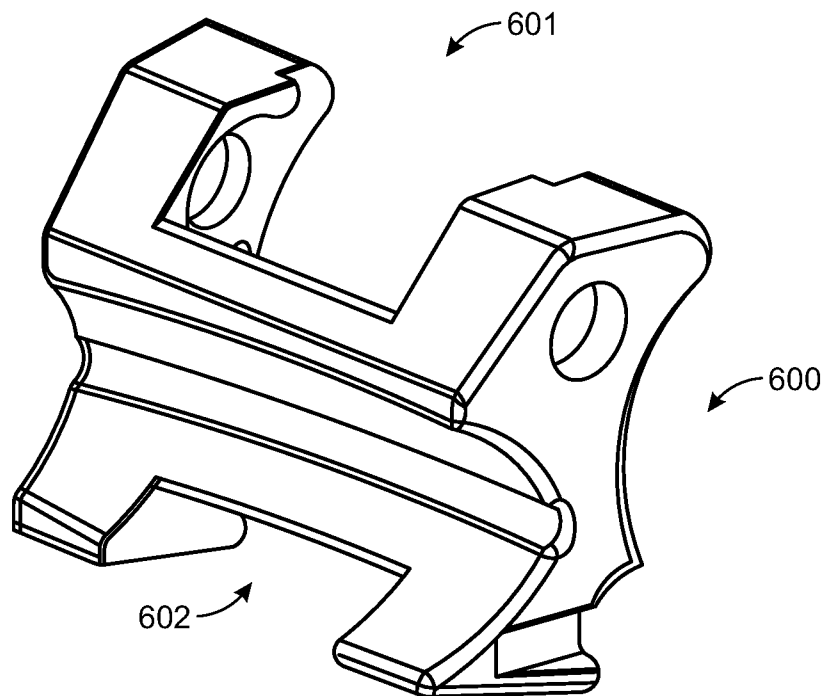


FIG. 34

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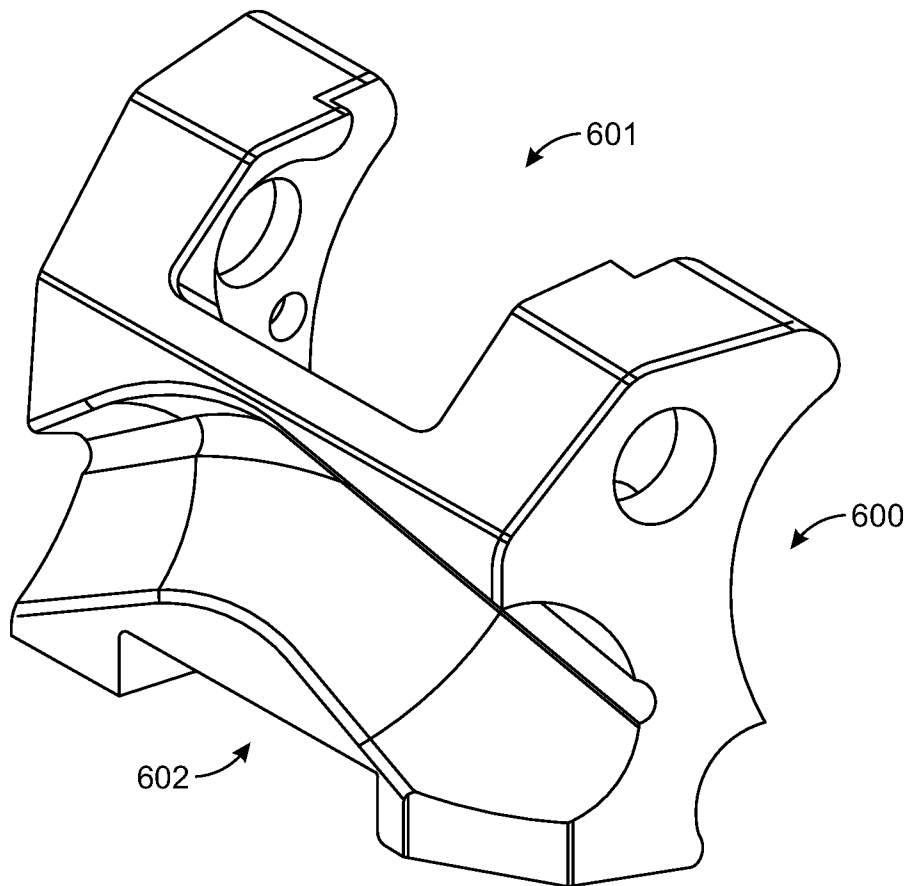


FIG. 35

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ2021/050087

A. CLASSIFICATION OF SUBJECT MATTER

A63B 69/00 (2006.01) A01K 15/02 (2006.01) B65H 75/34 (2006.01) B68C 1/00 (2006.01) F16D 59/00 (2006.01)
H02K 49/04 (2006.01) F16B 2/00 (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)

EPOQUE: EPODOC & WPIAP & TXTE: CPC/IPC Symbols: A01K15, A01K15/028, A01K27, A01K27/002, A01K27/003, A01K27/004, A01K27/005, A63B69/00, A63K, B65H75/34, B65H75/4418, B65H75/48, B68B1, B68B3, B68C1/00, F16D59/00, F16D63/002, F16D63/002, H02K49/04, H02K7/104, H02K7/125. **Keywords:** Retractable, extendable, shock-absorbing, lasso, lariat, rope, roping, winch, cattle, cow, livestock, horseback, eddy, eddie current, saddle, horn, attachment, clip, strap, dally wrap and similar terms and/or combinations.

Google/Google Patent/Espacenet: Keywords and symbols as above.

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	



Further documents are listed in the continuation of Box C



See patent family annex

* "A" "D" "E" "L" "O" "P"	Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance document cited by the applicant in the international application earlier application or patent but published on or after the international filing date document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) document referring to an oral disclosure, use, exhibition or other means document published prior to the international filing date but later than the priority date claimed	"T" "X" "Y" "&"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention 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 document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art document member of the same patent family
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Date of the actual completion of the international search
2 September 2021

Date of mailing of the international search report
02 September 2021

Name and mailing address of the ISA/AU

AUSTRALIAN PATENT OFFICE
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(ISO 9001 Quality Certified Service)
Telephone No. +61262223675

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ2021/050087

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
the subject matter listed in Rule 39 on which, under Article 17(2)(a)(i), an international search is not required to be carried out, including
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See Supplemental Box for Details

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

Supplemental Box**Continuation of: Box III**

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

This Authority has found that there are different inventions based on the following features that separate the claims into distinct groups:

- Claims 1 to 11 and 24 to 26 are directed to a braking device for controlling the movement of an animal attached thereto. The feature of a kinematic control system and driven member is specific to this group of claims.
- Claims 12 to 21 are directed to an attachment feature configured to link a braking device to an anchor. The feature of a body with a first attachment side for linking to a braking device and a second attachment side for releasably linking the attachment feature to an anchor is specific to this group of claims.
- Claims 22 to 23 are directed to a device made up of a combination of the above two claimed inventions. The feature of a combination thereof is specific to this group of claims.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

When there is no special technical feature common to all the claimed inventions there is no unity of invention.

In the above groups of claims, the identified features may have the potential to make a contribution over the prior art but are not common to all the claimed inventions and therefore cannot provide the required technical relationship. Therefore there is no special technical feature common to all the claimed inventions and the requirements for unity of invention are consequently not satisfied *a priori*.

INTERNATIONAL SEARCH REPORT		International application No.
C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		PCT/NZ2021/050087
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2017/0000088 A1 (Ellis Junior Smith) 05 January 2017 abstract, figs. 1A, 2, 4-5, 8-9, 11, 14-17, 22, [0019-0020], [0058], [0060], [0069], [0071-0072], [0076]	1-11, 24-26
X	US 6725810 B2 (Schwartz) 27 April 2004 abstract, figs. 1, 2E, 4A, col. 5 lines 56-63, col. 7 lines 42-53	1-11, 22-26
X	US 4304193 A (Madden) 08 December 1981 abstract, figs. 1-2, 5, col. 3 lines 49-64, col. 8 lines 10-23	1-8, 10-11, 24-26
X	US 6412722 B1 (Kreuser et al.) 02 July 2002 abstract, figs. 1, 3, col. 3 lines 17-19, col. 4 lines 46-58, col. 6 lines 58-60	1-3, 6-8, 10-11, 24-26
X	US 5692693 A (Yamaguchi) 02 December 1997 abstract, fig. 1, col. 2 lines 40-53, 60-64,	1-3, 6-7, 10-11, 24-26
X	US 8490751 B2 (Allington et al.) 23 July 2013 fig. 1	1
X	JP 2005034128 A (DAIWA SEIKO INC) 10 February 2005 fig. 1, [0007]	1
X	US 2017/0367303 A1 (Pullnot Leash Inc.) 28 December 2017 fig. 1	1
X	US 2004/0079056 A1 (Yarbrough) 29 April 2004 abstract, fig. 1-3, [0002]	12-13, 15-21
X	US 2016/0361577 A1 (D B Industries, LLC) 15 December 2016 figs. 1-2, 5B, 6A-6B, [0062], [0066]	12-14
X	US 2018/0093880 A1 (Adrian E. McPhaul) 05 April 2018 figs. 1-2, 4-6, [0018], [0020-0021]	12
X	US 2017/0267514 A1 (Booma Rein) 21 September 2017 figs. 4, 9A-9D, [0020]	12, 15-20
X	US 3027130 A (C. R. STUMPPFF) 27 March 1962 figs. 1-2	12, 20
Form PCT/ISA/210 (fifth sheet) (July 2019)		

INTERNATIONAL SEARCH REPORT		International application No.	
Information on patent family members		PCT/NZ2021/050087	
This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.			
Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
US 2017/0000088 A1	05 January 2017	US 2017000088 A1	05 Jan 2017
		US 9848583 B2	26 Dec 2017
		US 2018160654 A1	14 Jun 2018
US 6725810 B2	27 April 2004	US 2003116102 A1	26 Jun 2003
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		CN 106100285 B	18 Sep 2020
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Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		US 9016435 B2	28 Apr 2015
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		WO 2010104405 A2	16 Sep 2010

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Form PCT/ISA/210 (Family Annex)(July 2019)

INTERNATIONAL SEARCH REPORT		International application No.	
Information on patent family members		PCT/NZ2021/050087	
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		US 10232199 B2	19 Mar 2019
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Information on patent family members		PCT/NZ2021/050087	
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Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
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		US 10258814 B2	16 Apr 2019
		US 2016360868 A1	15 Dec 2016
		US 2019054329 A1	21 Feb 2019
		WO 2016048711 A1	31 Mar 2016
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		WO 2016200807 A1	15 Dec 2016
		WO 2016200809 A1	15 Dec 2016
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Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		WO 2016200890 A1	15 Dec 2016
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Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001. Form PCT/ISA/210 (Family Annex)(July 2019)			