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(54) **GOLF BALL RETRIEVAL SYSTEM WITH AUTOMATIC CABLE GUIDE**

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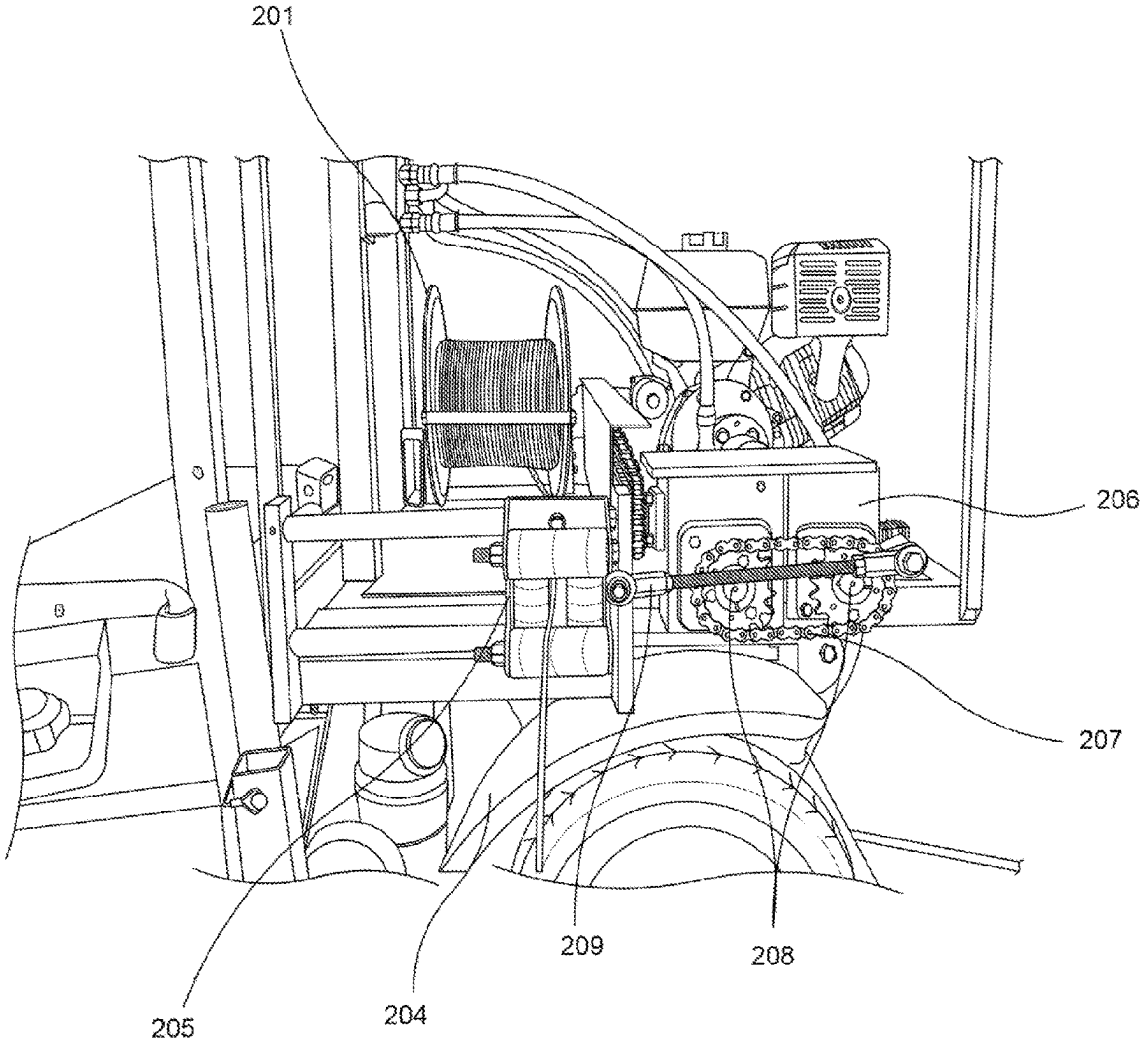
CPC ***A63B 47/021*** (2013.01)

(57) **ABSTRACT**

Golf ball retrieval system includes a mechanism for winding cable on a spool on the vehicle to evenly distributes the cable across the width of the spool as it is wound to prevent the cable from bunching up on one side of the spool or from binding on the spool. The spool is driven by a motor which is connected to two sprockets which are turned as the motor turns to wind or unwind the cable. An arm has one end connected to a chain connecting the sprockets and the opposite end connected to a cable guide carriage. As the motor rotates to wind or unwind cable onto or from the spool, the cable guide carriage reciprocates parallel with the axis of the spool to guide the cable onto or from the spool.



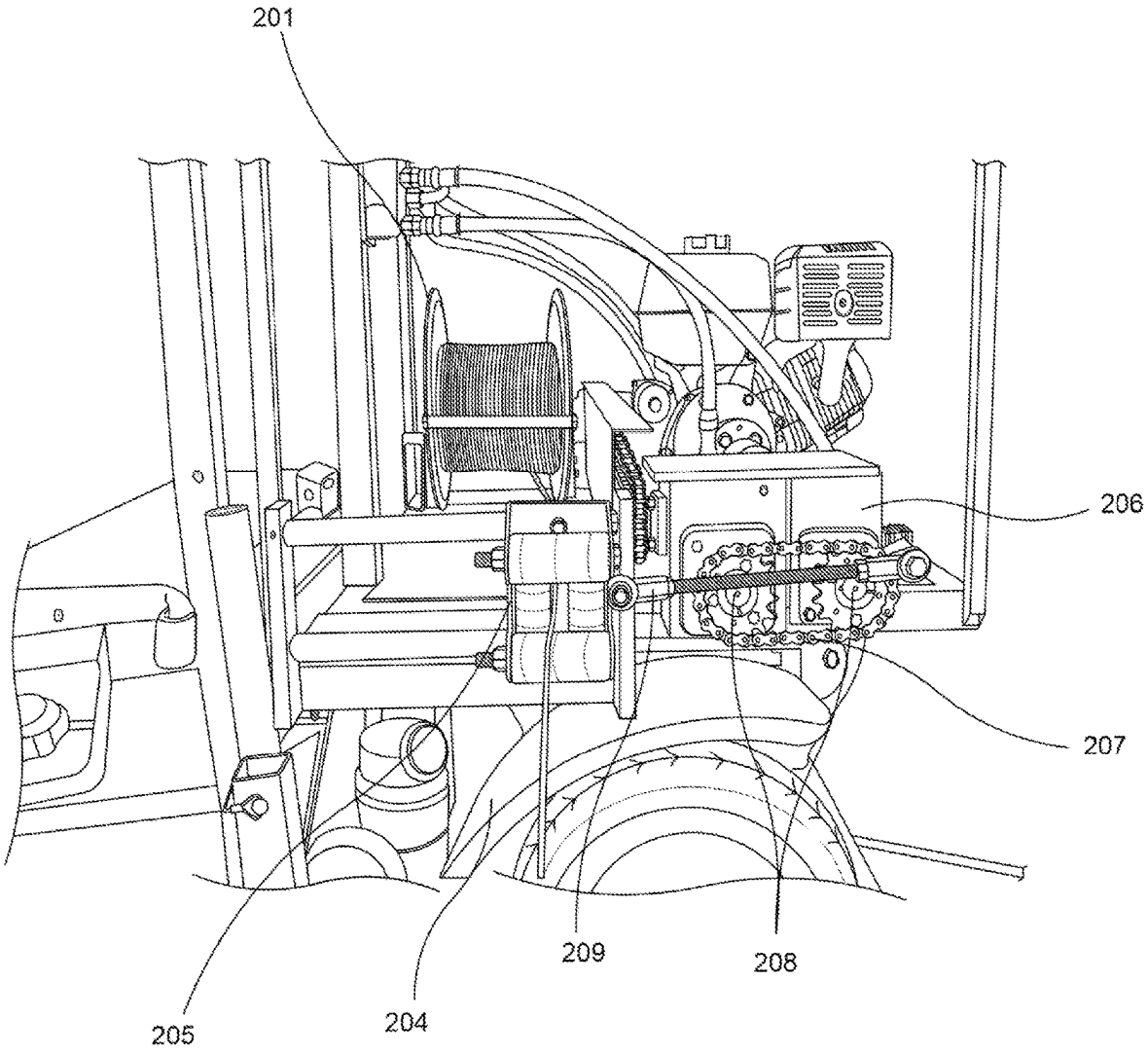


FIG.1

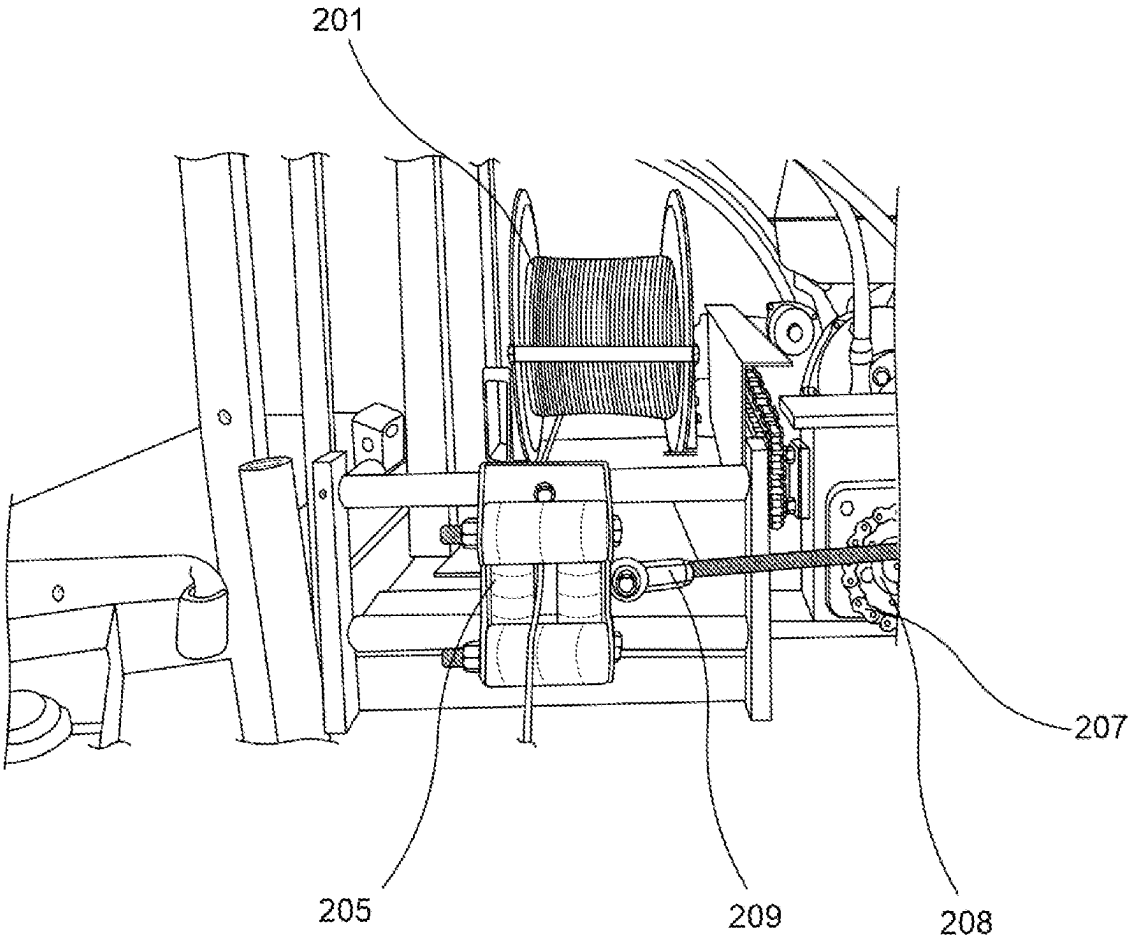


FIG.2

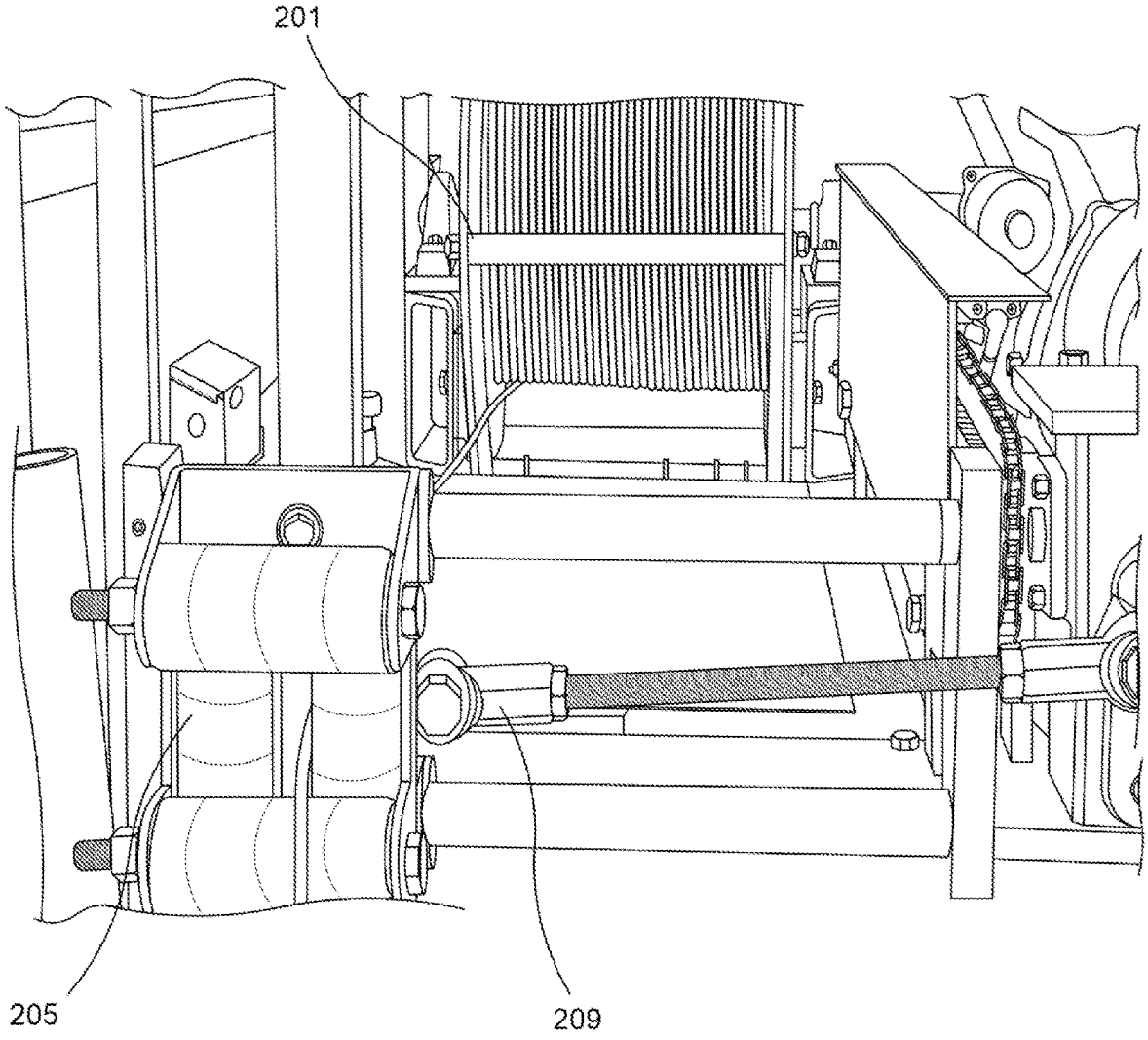


FIG.3

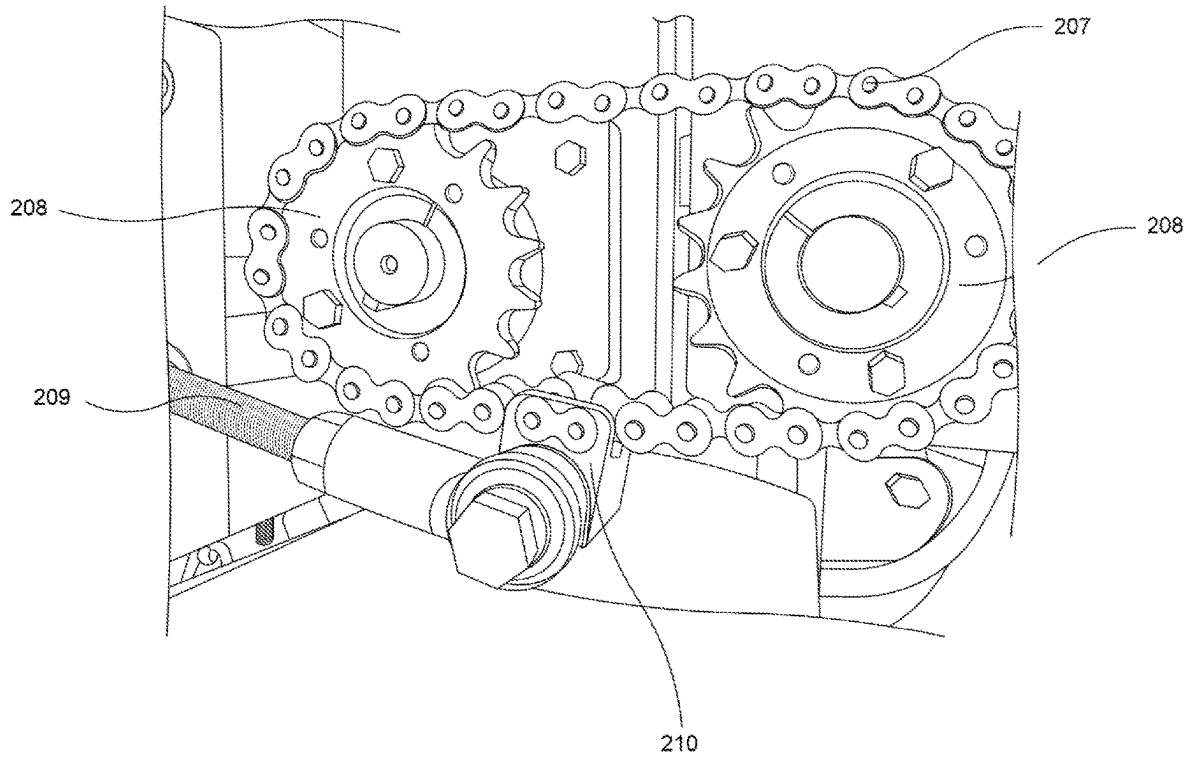


FIG.4

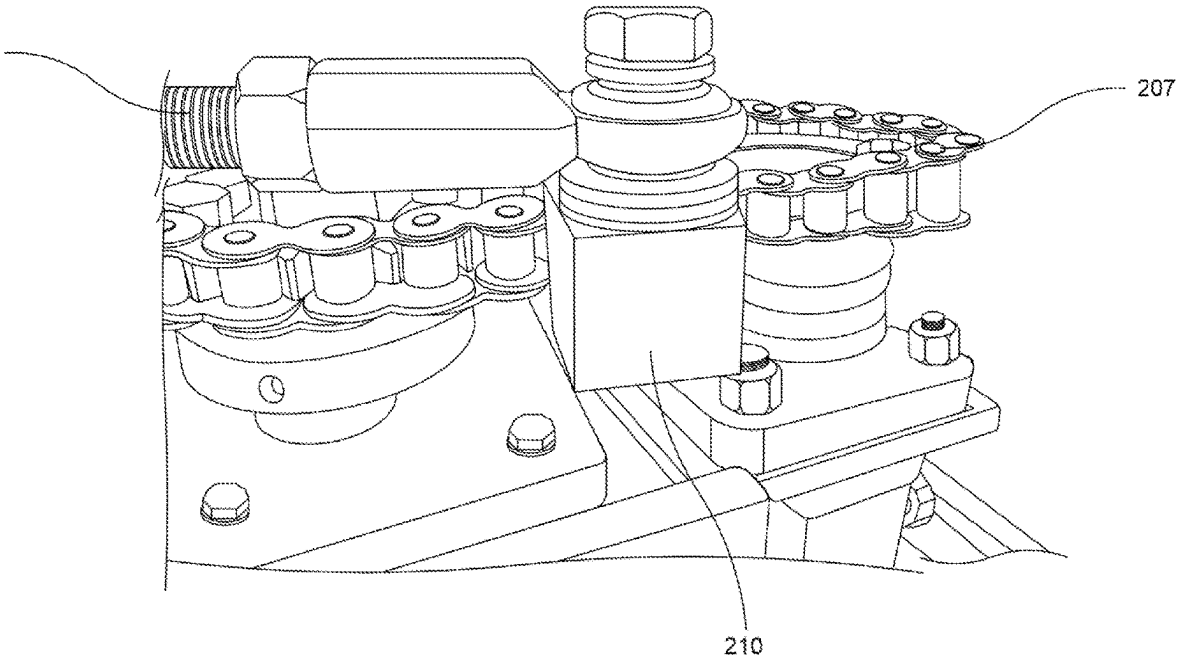


FIG.5

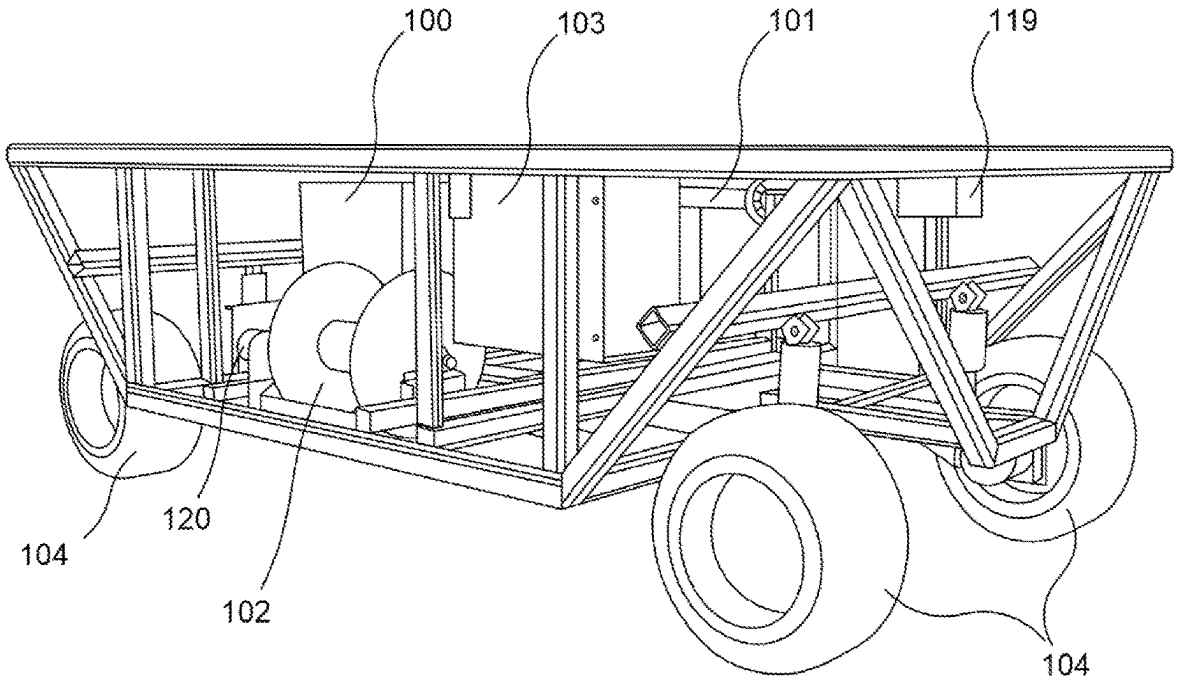


FIG.6

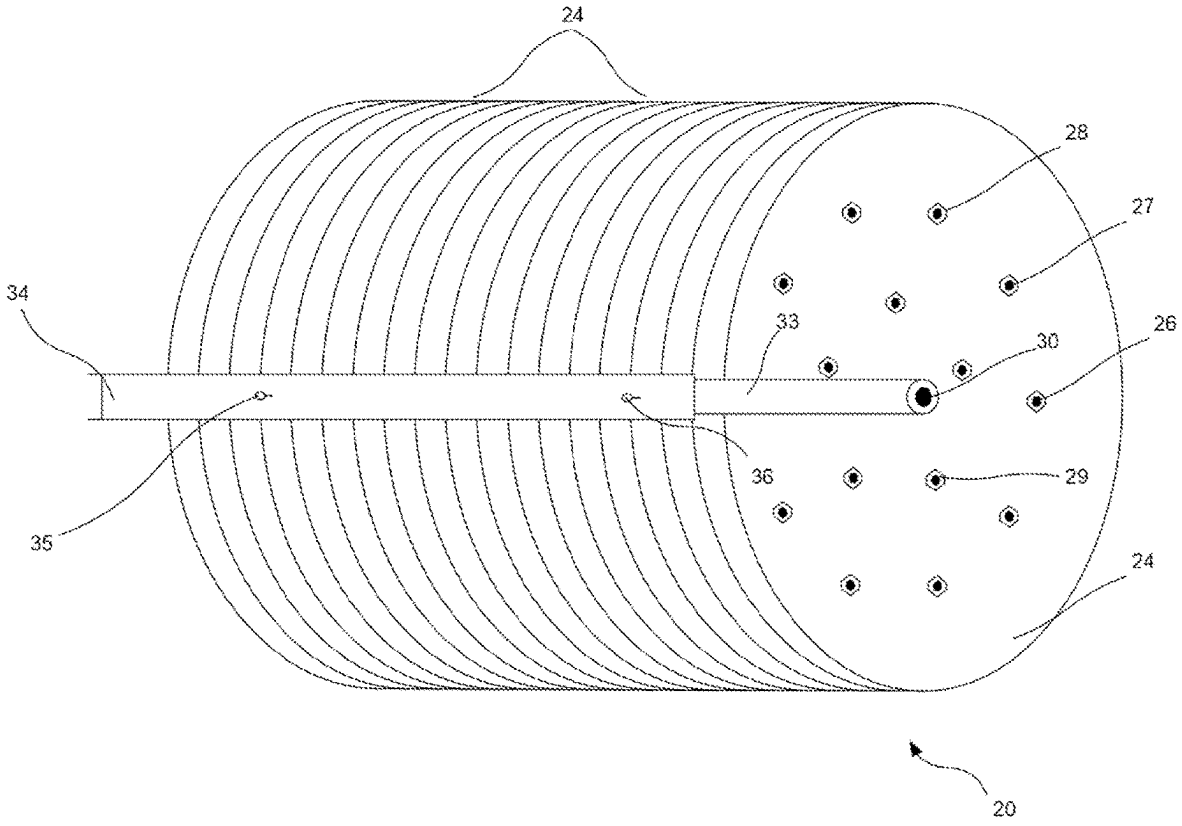
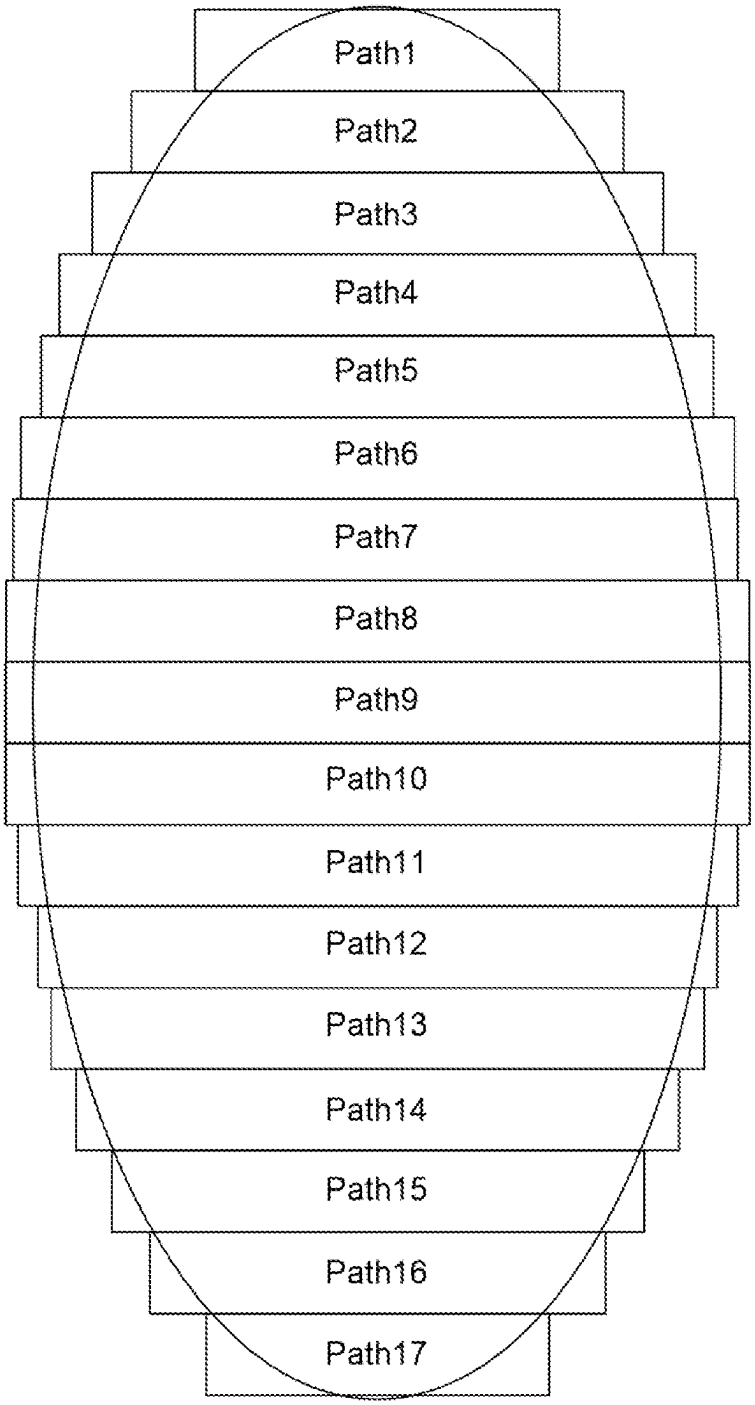


FIG.7


Path1
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Path4
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Path15
Path16
Path17

FIG.8

GOLF BALL RETRIEVAL SYSTEM WITH AUTOMATIC CABLE GUIDE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This US non-provisional patent application is a continuation in part of and claims priority to U.S. non-provisional patent application Ser. No. 17/005,953 filed 28 Aug. 2020, and also claims the benefit of and priority to U.S. non-provisional patent application Ser. No. 63/341,112 filed 12 May 2022, the entire contents of each of which are specifically incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to golf ball retrieval systems that include a ball retriever pulled by a cable.

BACKGROUND

[0003] Golf courses frequently encounter many of golf balls errantly hit into their water hazards or other areas. Golf ball retrieval systems retrieve these golf balls by dragging a retrieving device across the area. The retrieving device is pulled by a cable which winds onto a spool mounted on a vehicle. The cable spool must be unwound and wound many times as the retrieving device is moved across areas from which golf balls are retrieved. The cable is prone to become unevenly wound onto the spool or to bunch up or bind. This requires that time be taken to correct the bunching or binding and ensure that the cable winds evenly across the width of the spool. A system is desired that reduces the likelihood of a cable for a golf ball retrieving device from bunching or binding on a spool mounted on a vehicle.

[0004] Application WO-A-2009022929 describes an automatic golf ball collection system that can function autonomously or remotely controlled. It includes an artificial vision system to detect the balls to be collected, and a processing system which processes the images acquired by the artificial vision system, and which individually controls motors which move a collection vehicle, defining a path to be followed according to the detections found in the images. Several operational modalities are proposed with reference to the path to be followed by the collection vehicle, i.e., it has to pass along designated control points or control locations which are previously defined by a positioning system (for example GPS) of the collection system. The system provides the installation of a great variety of sensors which allow it to avoid all kind of obstacles and irregularities of the field (since it is intended for outdoor use—in particular, for a golf course), as well as to return to the base station if weather conditions are adverse. However, the system is not able to collect golf balls from water hazards, such as ponds.

[0005] Application US-A-20060018740 discloses a golf ball retrieval machine that includes an axle, a plurality of generally circular discs disposed on the axle, the discs being slightly flexible in a transverse direction near a peripheral edge of each disc, and a plurality of rods extending through the discs to maintain the discs in a spaced-apart relationship. A handle is secured to the axle to pull the golf ball retrieval machine underwater to retrieve golf balls from the bottom of the water between the rotating discs. The machine may be pulled under water by a boat. However, not all water hazards on a golf course are large enough to accommodate a boat to drag the golf ball retrieval machine across the water. Further, moving a boat to various water hazards is not an efficient process.

[0006] U.S. Pat. No. 9,561,403 discloses a collection apparatus including an autonomous power supply and an image acquisition means for acquiring image sequences of at least one area of surveillance. The collection apparatus may further include control means connected to the image acquisition means for receiving and processing the acquired sequences of images, to detect the presence and position of said game elements, and to send a control command to move the collection apparatus to collect a detected spherical game element. The collection apparatus also includes interaction means for interacting with a player to deliver a previously collected spherical game element to the player and a delivery device controlled by the control means to perform the delivery. An automatic collection system is also disclosed that uses two collection apparatuses, operating in a complementary and/or synchronized way to collect and deliver a spherical element to a player, on request by the player. This apparatus is not able to be used under water and would not be an effective apparatus for removing golf balls from water hazards on a golf course.

[0007] Some have used a similar golf ball retrieving device to that of Application US-A-20060018740 attached to two modified golf carts set on opposing sides of a water hazard to pull the retrieving device back and forth through the water hazard to retrieve golf balls. The golf ball retrieving device is attached to a cable from a winching system on each golf cart. The operators of the golf carts then take turns operating their winch system to pull the golf ball retrieving device toward them by winding the cable on their winch. Once the golf ball retrieving device is sufficiently full, the golf balls are manually removed from the retriever by the golf cart operator.

[0008] U.S. Pat. No. 4,767,073 discloses a stationary or mobile cable spooling system for winding up electrical cables used on drilling rigs comprised of an axle for insertion into a cable spool, a yoke for rotationally mounting the axle, a hydraulic motor coupled to the axle for rotating the spool and a cable guide system which evenly winds the cable onto the spool. However, this system suffers from undue cost and complexity and is prone to malfunction.

SUMMARY OF THE INVENTION

[0009] An object of the invention is to provide a vehicle comprising a golf ball retrieval system that includes a mechanism for winding cable on a spool on the vehicle in a manner that evenly distributes the cable across the width of the spool as it is wound to prevent the cable from bunching up on one side of the spool or from binding on the spool. The spool is driven by a motor which is connected to two sprockets which are turned as the motor turns to wind or unwind the cable. A link chain connects the two sprockets. An arm has one end connected to the chain and the opposite end connected to a cable guide carriage. As the motor rotates to wind or unwind cable onto or from the spool, the cable guide carriage reciprocates parallel with the axis of the spool to guide the cable onto or from the spool. This evenly distributes wound cable along the width of the spool and prevents the cable from bunching on the spool. An end of the cable may be connected to a golf ball retrieving device which is dragged across a location where golf balls are

located as the cable is would onto the spool and the retrieving device moves closer to the vehicle.

[0010] The system allows retrieval of golf balls in an efficient manner by a single user. In one embodiment the golf ball retrieving device is connected to a winch system located on each of two vehicles, one driven by a person, and one controlled by a wireless signal. When the winch is activated on the vehicle opposite the golf ball retrieving device, the golf ball retriever is pulled across the area containing golf balls. The area containing golf balls can be grass, sand, a pond, or other type of water hazard. The golf ball retrieving device rolls as it is pulled across the area and collects golf balls. Once the golf ball retrieving device reaches the opposite vehicle, the golf ball retrieving device can either be emptied or pulled back across the area containing golf balls by activating the opposite winch system.

[0011] When the first path between the vehicles is sufficiently clear of golf balls, the person can drive their vehicle to a next point and wirelessly drive the remote controlled vehicle to its next point to create a second path between the vehicles. The steps above can be repeated until the golf ball containing area is sufficiently clear of golf balls.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. **1** shows a vehicle having a spool, cable carriage positioned toward the right side of the spool, cable and a reciprocating arm that is driven by a chain mounted on a pair of sprockets.

[0013] FIG. **2** shows the components of FIG. **1**, but with the cable guide positioned near the center of the spool.

[0014] FIG. **3** shows the components of FIG. **1**, but with the cable guide positioned near the left side of the spool.

[0015] FIG. **4** shows two sprockets having a chain between them, and one end of an arm connected to the chain so it moves as the chain moves.

[0016] FIG. **5** shows a bottom view of the components that connect the arm to the chain.

[0017] FIG. **6** shows a representative frame of a vehicle on which a spool may be mounted.

[0018] FIG. **7** shows a golf ball retrieving device.

[0019] FIG. **8** is an illustration of potential paths over which a golf ball retrieving device may be moved to retrieve golf balls.

DETAILED DESCRIPTION

[0020] The present invention provides a golf ball retrieval system that utilizes a vehicle as shown in FIG. **6** which can be moved to a location where golf balls may be retrieved and which may pull a golf ball retrieval device as show in FIG. **7**. A golf ball retrieval device may be positioned away from the vehicle, and connected by a cable to a winch/spool mounted on the vehicle. As the cable is wound up onto the spool, the golf ball retrieving device moves across the area to retrieve golf balls. The cable may then be unwound and the golf ball retrieval device may be moved to a new location, and the process is repeated. The golf ball retrieval device may be pulled along adjacent paths as shown in FIG. **8** to retrieve all golf balls in a desired area.

[0021] One problem with past golf ball retrieving devices is that when winding the cable onto the spool, the cable is not wound evenly across the width of the spool, causing it to bind or get bunched up. The disclosed system may include a carriage through which the cable passes. The spool has a width for example, 10.5 inches, and winds cable, such as ¼" steel cable. The winch may be powered by a motor such as a hydraulic motor. The winch driveshaft may be connected to gearboxes by a chain. The gearbox includes a pair of sprockets connected by a chain, such as No. 50 roller chain with a ⅝" pitch between links. An arm is connected to one of the chain links at one end, and to the carriage at the opposite end.

[0022] In FIG. **1**, carriage **205** is at the far right, which facilitates the winding of the cable onto or from the spool **201** at its right side. As spool rotates to wind or unwind the cable, the chain **207** and gearbox **206** cause the arm to move to the left as shown in FIGS. **4** and **5** so that the cable is wound or unwound across the width of the spool, so that the cable does not bunch up or bind.

[0023] The gearing of the spool shaft and sprockets **208** that reciprocates arm **209** is such carriage **205** is moved on a carriage support one width of the drum to account for the width of the cable. For example, in an embodiment where the spool **201** is 12" wide and cable **204** is ¾" in diameter, the gearing may provide for the carriage to move the full 12" width for each 48 revolutions of the drum, as 48×¼" equals 12".

[0024] Arm **209** may be connected to chain **207** as follows. One link of the chain is replaced with a double **50** connecting link **210** as shown in FIGS. **4** and **5**. A 1¼" square cold rolled steel bar is machined to fit over the double link **210**. A rod and bearing connect the end of arm **209** to the steel bar/link.

[0025] The golf ball retrieval system may utilize a first vehicle as shown in FIG. **6**. The first vehicle may be a modified golf cart, such as a Yamaha G23, with a winching system, for moving a golf ball retrieving device as shown in FIG. **7**.

[0026] As shown in FIG. **6**, the vehicle includes a winching system for moving the golf ball retrieving device of a winch motor **120** which rotates spool **102** along an axis. The winch motor may be electric or hydraulic such as a Danfoss 11186143 OMRX200.

[0027] FIG. **7** shows a representative golf ball retrieving device **20**. The golf ball retrieving device **20** is comprised of an axle **30** containing a plurality of circular disks **24** evenly spaced to accommodate a golf ball, approximately 1.7 inches. The disks **24** are spaced using a plurality of rods **26**, **28**, **29** that extend through each disk. The rods **26**, **28**, **29** are held in place using a threaded fastener **27**. The golf ball retrieving device **20** has a frame with arms **33** and a handle **34** that extends from the ends of the axle **30** to allow the retriever to roll. Eyelets **35**, **36** located on the handle **34** attach winch cables.

[0028] While the invention has been illustrated and described in detail in the foregoing drawings and description, the same is to be considered as illustrative and not restrictive in character, it being understood that only illustrative embodiments thereof have been show and described and that all changes and modifications that are within the scope of the following claims are desired to be protected.

[0029] All references cited in this specification are incorporated herein by reference to the extent that they supplement, explain, provide a background for or teach methodology or techniques employed herein.

What is claimed is:

1. A golf ball retrieval system comprising:

a vehicle;

a golf ball retrieving device;

a spool mounted on the vehicle comprising cable wound thereon that is connected to the golf ball retrieval device; the spool having a width greater than the width of the cable;

the spool comprising an axis;

a motor connected to the spool operable to rotate the spool to wind the cable onto the spool;

a pair of sprockets connected by a chain, at least one of the sprockets being operably connected to the motor such that the sprockets rotate when the motor rotates the spool to thereby move the chain;

a cable guide through which the cable passes;

an arm connecting the chain to the cable guide, such that the cable guide reciprocates parallel with the axis of the spool to thereby guide the cable along the width of the spool.

* * * * *