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(54) **REMOTE CONTROLLED OPENING AND CLOSING SYSTEM OF A LIFTING BAG**

(57) The invention relates to a remote controlled opening and closing system (200) of a lifting bag (202; 301, 302) of a semi-underground waste container (204). The system (200) comprises a pulling line tube (209), a pulling line (201) arranged inside the tube (209), a battery-operated remotely controllable emptying device (401), a remote controller (400) comprising selection switches (405, 406) for closing and opening. The remote controller (400) is wirelessly (410) connected to the emptying device (401) and transmits control signals to the emptying device (401) for closing and opening the lifting bag (202; 301, 302) as a result of selection of a switch (405, 406). A first end of the pulling line (201) is connected to the lower part of the lifting bag (202; 301, 302) and the second end to the emptying device (401). When the selection switch (405) for closing the lifting bag (202; 301, 302) is selected, the pulling line (201) is pulled so that the lifting bag (202; 301, 302) closes, and when the selection switch (406) for opening the lifting bag (202; 301, 302) is selected the pulling line (201) is released so that the lifting bag (202; 301, 302) opens.

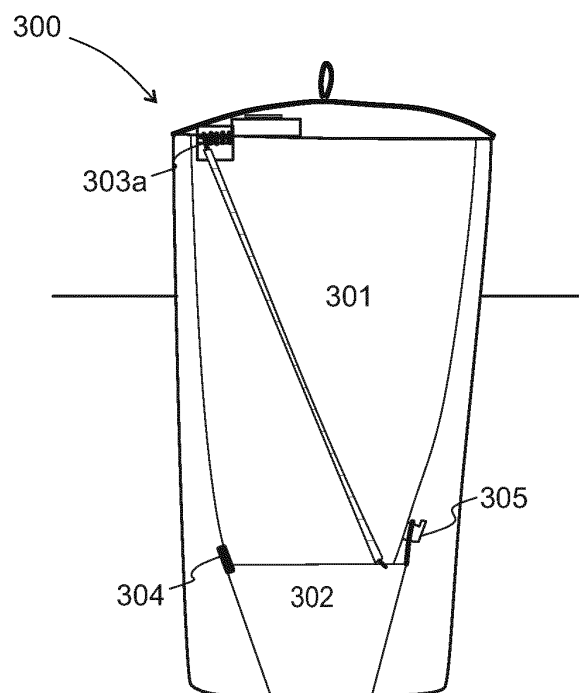


Fig. 3a

Description

Field of the invention

[0001] The present invention relates to a remote controlled opening and closing system of a lifting bag of a semi-underground waste container.

[0002] Furthermore, the present invention relates to a semi-underground waste container comprising a remote controlled opening and closing system of a lifting bag, a remote controlled opening and closing system kit of a lifting bag for retrofitting a semi-underground waste container and a method for remotely opening and closing a lifting bag of a semi-underground waste container.

Background

[0003] Present day consumption habits produce large amounts of waste, whereas at the same time, space, especially tightly populated areas, is running low. Therefore, semi-underground waste containers are increasing their share among waste containers.

[0004] A semi-underground waste container is based on a vertical structure in which generally over 50 % of the container is located underground. The containers occupy a minimal surface area that allows practical waste collection solutions even in small and confined spaces. Semi-underground waste containers enable the use of larger containers. Furthermore, gravity compacts the waste by its own weight inside the containers. Therefore, semi-underground waste containers enable less frequent waste collection. The large waste capacity reduces emptying traffic in the area and minimizes environmental load. Increasing intervals between emptyings reduces fuel costs and emissions.

Summary

[0005] Now there has been invented an improved method and technical equipment implementing the method to be used when emptying a lifting bag of a semi-underground waste container. Embodiments of the invention provides remote controlling means for opening and closing the lower part of the lifting bag and a method for remotely opening and closing a lifting bag of a semi-underground waste container for emptying.

[0006] According to a first aspect of the invention, there is provided a remote controlled opening and closing system of a lifting bag of a semi-underground waste container for closing and opening the lifting bag. The opening and closing system comprises: a pulling line tube, a pulling line that is at least partly arranged inside the pulling line tube, a battery-operated remotely controllable emptying device that is a wince comprising a rotatable drum and a motor that is drivingly connected to said rotatable drum, a remote controller comprising a selection switch for closing the lifting bag and a selection switch for opening the lifting bag. The remote controller is wirelessly con-

nected to the wince and arranged to transmit control signals to the wince for closing and opening the lifting bag as a result of selection of a switch. A first end of the pulling line is connected to the lower part of the lifting bag and the second end to the drum of the wince. If the selection switch for closing the lifting bag is selected, the emptying device receives the closing control signal and the pulling line is pulled by the wince so that the pulling line wraps around the drum and the lifting bag closes. And if the selection switch for opening the lifting bag is selected the wince receives the opening control signal and the pulling line is released by the wince so that the pulling line unwraps from the drum and the lower part of the lifting bag opens.

[0007] According to an embodiment, the lifting bag is a soft lifting bag and the first end of the pulling line is connected around the lower part of the lifting bag, and for closing the lifting bag, the pulling line is pulled so that first end of the pulling line compresses around the lower part of the lifting bag, and for emptying the lifting bag, the pulling line is released so that the compression of the first end of the pulling line around the lower part of the lifting bag releases. According to an embodiment, the lower part of the lifting bag is a container and the first end of the pulling line is connected to the container, and for closing the lifting bag, the pulling line is pulled so that the container tilts underneath the upper part of the lifting bag, and for emptying the lifting bag, the pulling line is released so that the container tilts away underneath the lifting bag. According to an embodiment, the pulling line is a polypropylene rope. According to an embodiment, the pulling line tube is a flexible hydraulic hose. According to an embodiment, the remote controlled opening and closing system comprises a solar cell. According to an embodiment, the lower part of the lifting bag comprises a RFID tag arranged to be read by a RFID reader of a collection vehicle before opening of the lifting bag is enabled.

[0008] According to a second aspect of the invention, there is provided a method for closing and opening a lifting bag of a semi-underground waste container by a remote controlled opening and closing system comprising a remote controller comprising a selection switches for closing and opening the lifting bag, a battery-operated remotely controllable emptying device that is a wince comprising a rotatable drum and a motor that is drivingly connected to said rotatable drum, and a pulling line. A first end of the pulling line is connected to the lower part of the lifting bag and the second end of the pulling line is connected to the drum of the wince. The method comprises: receiving a switch selection for opening the lifting bag by the remote controller, transmitting an opening control signal from the remote controller to the wince, and releasing the pulling line by the wince so that the pulling line wrapped around the drum un-wraps from the drum and the lower part of the lifting bag opens.

[0009] According to an embodiment, the method further comprises receiving by the remote controller a switch selection for closing the lifting bag, transmitting an open-

ing control signal from the remote controller to the emptying device, and pulling the pulling line so that the lifting bag closes. According to an embodiment, the lifting bag is lifted from the semi-underground waste container, before opening the lifting bag.

Description of the Drawings

[0010] In the following, various embodiments of the invention will be described in more detail with reference to the appended drawings, in which

- Fig. 1a shows a cross-sectional view of a present day opening and closing system of a semi-underground waste container with a closed lifting bag;
- Fig. 1b shows a cross-sectional view of the opening and closing system of figure 1 a with an open lifting bag;
- Fig. 2a shows an opening and closing system of a lifting bag of a semi-underground waste container with a closed lifting bag according to an embodiment of the invention;
- Fig. 2b shows an opening and closing system of a lifting bag of a semi-underground waste container with an open lifting bag according to an embodiment of the invention;
- Fig. 3a a remote controlled opening and closing system of a lifting bag of a semi-underground waste container with a closed bag according to an embodiment of the invention;
- Fig. 3b a remote controlled opening and closing system of a lifting bag of a semi-underground waste container with a closed bag according to an embodiment of the invention;
- Fig. 3c shows an opening and closing system of a lifting bag of a semi-underground waste container with an open lifting bag according to an embodiment of the invention
- Fig. 4 shows a schematic view of a remote controller of an opening and closing system according to an embodiment of the invention; and
- Fig. 5 shows a flowchart of a method for remotely opening and closing a lifting bag of a semi-underground waste container according to an embodiment of the invention.

Description of Example Embodiments

[0011] Semi-underground waste containers or under-

ground waste containers comprise at least a frame well, a lid and a reusable lifting bag. The frame well of a semi-underground waste container is at least partially embedded in the ground i.e. at least part of the frame well is below the ground level. Semi-underground waste containers are emptied through the bottom i.e. the lower part of the lifting bag. For emptying, the lifting bag is lifted and positioned over a collection vehicle by using a hydraulic arm and a lifting chain. For lifting there are typically strapping bands or a lifting loop arranged in the upper part of the lifting bag and the lifting chain is attached to the bands or lifting loop. For emptying the lower part of the bag is opened so that waste may fall from the bag into the collection vehicle. Nowadays, a driver of the collection vehicle or some other person needs to open the lower part for emptying by releasing a manual opening and closing system of the bag. The manual opening and closing system may be a rope or the like having an open position and a closed position and arranged in the bottom area of the bag. When the rope is in the closed position, the rope is pulled tight enough around the lower part of the bag so that the lower part of the bag is compressed and waste may be fed to the closed bag. The manual opening and closing system may be locked in the closed position, for example, by any suitable locking mean, for example by using a rope loop and a pin, a rope holder, or a rope lock. When the manual opening and closing system is in the open position, the rope is released so that compression around the lower part of the bag is released and the lower part of the bag is open so that waste may fall from the bag, for example, to a collection vehicle. After emptying the bag is closed and the closed bag is lifted back to the container.

[0012] Semi-underground waste containers comprising a manual opening and closing system for emptying purposes require a person to open and close the bag manually. However, the lower part of the lifting bags or the opening and closing ropes may become unhygienic and/or dirty in use, and therefore opening or closing may be unpleasant or dirty, because the bag has to be opened and closed by hands in close proximity to the lower part of the bag and in touch with the opening and closing rope. Additionally, manual closing or opening may require some training and muscle strength.

[0013] In the following, several embodiments of the invention will be described in the context of a remote controlled opening and closing system of a lifting bag of a semi-underground waste container and a semi-underground waste container comprising a remote controlled opening and closing system of a lifting bag. Further, a method for remotely opening and closing a lifting bag of a semi-underground waste container according to an embodiment of the invention is described. It is to be noted, however, that the invention is not limited to shown embodiments only and at least part of solutions of the shown embodiments are compatible.

[0014] In embodiments of the invention, a remote controlled opening and closing system is arranged to remote-

ly open and close the lower part of the lifting bag of a semi-underground waste container comprising a lifting bag and a lid. The opening may be done by un-compressing the lower part of the bag in a case of a soft lifting bag (woven bag) or by tilting the lower part (made of hard material) of the lifting bag away from the upper part (made of hard or soft material) of the lifting bag. The closing may be done by compressing the lower part of the bag in a case of a soft lifting bag (woven bag) or by tilting the lower part (made of hard material) of the lifting bag underneath the upper part (made of hard or soft material) of the lifting bag. The remote controlled opening and closing system comprises a pulling line tube, a pulling line, a battery, a remote controller, and a remotely controllable emptying device. The pulling line tube, the pulling line, the battery and the remotely controllable emptying device may be arranged in connection with the semi-underground waste container so that the pulling line tube and the pulling line are attached to the lifting bag of the semi-underground waste container and the battery may be attached to the frame structure or the lid of the semi-underground waste container and the remotely controllable emptying device is attached to the frame structure or the lid of the semi-underground waste container. The battery may also be an integrated part of the remotely controllable emptying device. The pulling line is arranged to be connected to the emptying device, which, in a case of a winch, reels in the pulling line by pulling it so that the pulling line wraps around the drum of the emptying device and also reels out the pulling line by releasing the pulling line so that the pulling line wrapped around the drum of the emptying device unwraps and which, in a case of a linear motor, pulls the line by retracting its cylinder rod so that the bag closes and also releases the pulling line by obtruding its cylinder rod so that the bag opens.

[0015] The frame structure of the semi-underground waste container is, for example, a metal frame structure arranged to be fixed to the upper part of the lifting bag. When the lifting bag is inside the waste container and more particularly inside the frame well, the frame structure supports the lifting bag to its place. The frame structure may comprise, for example, protrusions or other suitable structure, which support the lifting bag inside the frame well. When the bag is inside the frame well, protrusions are on the edges of the frame well. For example, if the frame well is a rectangle, when seen from above, the frame structure may comprise at least one protrusion for each side of the frame well, or if the frame well is a circle, when seen from above, the frame structure may comprise protrusion, for example, for 4 to 8 points in the circle. A lifting loop may be a part of the frame structure. The lifting loop extending through an opening of the lid, when the lid is closed, is arranged to be used for lifting the bag from the container for emptying. When the lifting bag is lifted for emptying by means of the lifting loop of the quick system device, the lid, the frame structure, the lifting bag and the remote controlled opening and closing system are also lifted. The frame structure may be formed

to be suitable for any shape or size of a semi-underground waste frame well. When seen from above, the shape of a semi-underground waste frame well may be circular, rectangular, oval, pentagon, hexagon etc. The lid may also be formed to be suitable for the shape and size of the frame well of the semi-underground waste container.

[0016] The lifting bag may be any type of structure inside a semi-underground waste container that is arranged to be lifted from the container for emptying and arranged to be opened from the bottom when emptied. The lifting bag may be made of, for example, woven polypropylene, plastic, durable plastic, aluminum and stainless steel or a combination of these. In other words, the lifting bag may, in this context, also be a lifting bag comprising a container as a lower part; the container may be made of, for example, above mentioned plastic, durable plastic, aluminum or stainless steel. When the lower part of the lifting bag is a container, the upper part of the lifting bag may be soft bag or also made of above mentioned hard materials.

[0017] The pulling line tube may be, for example, a flexible hydraulic hose or the like and made of, for example, rubber. The inner diameter of the tube may be at least such that the pulling line can move substantially freely within the tube when the pulling line is released or pulled. The first end of the pulling line tube is arranged to in the vicinity of the upper part of the lifting bag and the second end is arranged to in the vicinity of the lower part of the lifting bag and the tube is arranged at least partially around the pulling line and to extend on the outer side of the lifting bag. The pulling line is arranged to prevent crumpling of an empty bag, for example, while closing the empty bag by pulling the pulling line. Because of the pulling line tube, the pulling line will not be pulled too tight.

[0018] The pulling line may be, for example, a polypropylene rope or a rope made of some other suitable material. In some cases, it may be possible to use a metal wire as a pulling line. The wire may be coated with a suitable material or the wire may be arranged inside a suitable rope. The pulling line has such a thickness i.e. transverse diameter that it could hold up a proposed weight of waste inside the lifting bag of the container. The pulling line diameter may be, for example, 10 to 15mm, for example, 12mm.

[0019] The battery of the remote controlled opening and closing system may be, for example, a chargeable battery or non-chargeable battery arranged to act as a power supply for the emptying device. Battery charge of a chargeable battery may be maintained by means of a solar cell.

[0020] The remotely controllable emptying device of the remote controlled opening and closing system may be, for example, any type of device comprising suitable means for pulling and releasing the pulling line. The emptying device may be battery operated. The emptying device may be, for example an electronic winch or an elec-

tronic motor and gear or a linear motor. The wince may comprise a rotatable drum, a motor and an emptying device control module for connecting the battery to the motor and for receiving control signals for operation of the lifting device. The motor is drivingly connected to the rotatable drum suitable for wrapping the pulling line of the remote controlled opening and closing system around the drum while closing the bag. The battery of the remote controlled opening and closing system is connected to the motor. The emptying device control module may comprise a microprocessor chip which is connected to the battery of the remote controlled opening and closing system, a RF receiver or a Bluetooth wireless receiver with an antenna, and a control circuitry for receiving control signals from the remote controller. The emptying device may also act as a pulling line lock for the pulling line when the emptying device is not pulling or releasing the pulling line.

[0021] The remote controller controlling the remotely controllable emptying device may be, for example, any device capable of transmitting wireless control signals to the emptying device. The control signal may be, for example, a control signal for pulling (CLOSE) or releasing the pulling line (OPEN). If the remote controller transmits the control signal for releasing the pulling line, the lifting bag will be opened. And if the remote controller transmits the control signal for pulling the pulling line, the lifting bag will be closed. There may be two separate buttons in the remote controller, one for opening the lifting bag, for example, an OPEN button and one for closing the lifting bag, for example, a CLOSE button. The remote controller comprises a transmitter. The transmitter may comprise a microprocessor chip which is connected to a battery of the remote controller, an RF transmitter or a Bluetooth wireless transmitter with an antenna, and a control circuitry for transmitting control signals to the receiver of the emptying device. The remote controller thus transmits control signals, for example, over a short range radio connection, a long range radio connection a Bluetooth connection or a low-power consumption Bluetooth connection to the emptying device. The remote controller and the remotely controllable emptying device have the like devices for transmitting/receiving control signals, for example, both use RF, Bluetooth or low-power consumption Bluetooth connection. The remote controller and the remotely controllable emptying device may be paired so that one remote controller controls only one emptying device. Furthermore, the remote controlled opening and closing system according to embodiments may further comprise a safety switch button, which has to be pushed before the opening of the lifting bag for emptying is possible.

[0022] The remote controlled opening and closing system according to embodiments may further comprises at least two pulling holders arranged at the lower part of the lifting bag for guiding the pulling line such that the pulling line arranged around the lower part of the bag does not fall or rise but stays in its place while opening and closing

the bag by pulling/releasing the pulling line.

[0023] The remote controlled opening and closing system according to embodiments may further comprise a solar cell that may be arranged on the lid of the container, on the outer side of the lid. The solar cell may be arranged to charge the battery of the emptying device or it may be used as a maintenance charger for the emptying device.

[0024] Figure 1 a shows a cross-sectional view of a prior art manual opening and closing system 10 of a semi-underground waste container 14, when a lifting bag 12 is closed. The manual opening and closing system 10 comprises a pulling line 11, and at least two pulling line holders 17, and a pulling line lock 16. One end of the pulling line 11 is arranged around the lower part of the bag 12. The manual opening and closing system 10 is arranged to be fixed to a lifting bag 12 that is arranged inside a frame well 13 of the semi-underground waste container 14 for collecting waste. Further, a lid 15 is arranged on the lifting bag 12 and the semi-underground waste container 14. When the pulling line 11 is pulled tight the lower part of bag 12 compresses, which close the bag 12. After tightening the pulling line 11 is locked in its place to the pulling line lock 16.

[0025] Figure 1b shows the cross-sectional view of the manual opening and closing system 10 of figure 1a, when the bag 12 is open and lifted above the frame well 13 for emptying. The pulling line 11 is released from the pulling line lock 16 so that the lower part of bag 12 un-compresses which loosens the pulling line 11 and opens the lower part of the bag 12 around which the pulling line is arranged. Waste can freely fall out through the open lower part of the bag 12.

[0026] Figure 2a shows a partly cross-sectional view of a remote controlled opening and closing system 200 of a lifting bag 202 of a semi-underground waste container 204 with the bag 202 closed according to an embodiment of the invention. The opening and closing system 200 comprises a pulling line 201, a battery 206, a remotely controllable wince as an emptying device 208, a pulling line tube 209, a solar cell 210 and at least two pulling line holders 207. The first end of the pulling line 201 is arranged around the lower part of the bag 202 and it extends through the at least two pulling line holders 207 also arranged to the lower part of the bag 202 on its way. The second end of the pulling line 201 is fixed to the remotely controllable emptying device 208 comprising a drum 221. The pulling line tube 209 is arranged around the pulling line 201 i.e. the pulling line 201 is arranged inside the tube 209 and the tube 209 extends from the upper part of the bag 202, for example from the proximity of the remotely controllable emptying device 208, to the lower part of the bag 202, for example, to the proximity of the point where the pulling line 201 surrounds the lower part of the bag 202 and wherein the bag 202 is compressed when closed. The solar cell 210 is arranged to be fixed to a lid 205 of the semi-underground waste container 204 and the battery 206 is arranged to be fixed to a lid 205 or to the frame structure (not shown) of the semi-

underground waste container. The remotely controllable emptying device 208 is arranged to be fixed to the frame structure. There is an electronic connection between the battery 206 and the remotely controllable emptying device 208 and between the battery 206 and the solar cell 210. The lifting bag 202 is arranged inside the frame well 203.

[0027] When closing the bag 202, the remotely controllable emptying device 208 reels in the pulling line 203 by pulling the pulling line 201 so that the pulling line wraps around the drum 221 and the lower part of bag 202 compresses, which closes the lower part of the bag 202. When opening the bag 202, the remotely controllable emptying device 208 reels out the pulling line 203 by releasing the pulling line 201 so that the pulling line 201 wraps away from the drum 221 and the lower part of bag 202 un-compresses, which opens the bag 202. The pulling line 201 can be locked in place by the remotely controllable emptying device 208.

[0028] Figure 2b shows the partly cross-sectional view of the opening and closing system 200 of figure 2a, when the bag 202 is open and lifted above the frame well 203. The pulling line 201 is unwrapped from the drum 221 of the remotely controllable emptying device 208 by releasing the line 201. When the bag 202 is arranged to be opened the remotely controllable emptying device 208 is unlocked, which unwraps the line 201 from the drum 221 i.e. loosens the pulling line 11, which, in turn, un-compresses the lower part of bag 202 and thus opens the lower part of the bag 12 around which the pulling line 201 is arranged. Through the opening 222 of the lower part of the bag 202, waste can freely fall out.

[0029] The remotely controllable emptying device 208 is remotely controlled to close i.e. pull or open i.e. release the pulling line by a remote controller comprising switches for both actions. The remote controller is connected to the remotely controllable emptying device 208 by a RF, a Bluetooth connection or a low-power Bluetooth connection.

[0030] The solar cell 210 is optional. In addition, there may be a pulling line guide in the proximity of the remotely controllable emptying device 208 that guides the pulling line during pulling and releasing. The pulling line guide may be fixed, for example, between the remotely controllable emptying device 208 and the pulling line tube 209. In addition, it is also possible that the pulling line tube 209 is a little bit longer or shorter or that it is formed from several inflexible tube parts instead of continuous flexible tube. It should also be noted that even if the pulling line tube 209 is flexible, it is so thick and of such material that it does not crumple.

[0031] Figure 3a shows a partly cross-sectional view of a remote controlled opening and closing system of a lifting bag of a semi-underground waste container 300 with the bag closed according to an embodiment of the invention. The lifting bag of this embodiment is so called hard lifting bag, because its lower part is a container 302. The container 302 is, as closed, arranged underneath

the upper part 301 of the lifting bag that may be hard or soft. The container 302 is tiltable connected to the upper part of the lifting bag by a hinge 304 or a correspondingly working device. Also a mechanical security switch 305 that needs to be opened by hands before opening of the lifting bag is enabled is shown. In this embodiment the emptying device 303a is a winch.

[0032] Figure 3b shows a partly cross-sectional view of a remote controlled opening and closing system of a lifting bag of a semi-underground waste container 300 with the bag closed according to an embodiment of the invention. Also a security switch, which in this embodiment is a RDID tag 306 that needs to be read by a RFID reader of a collection vehicle before opening of the lifting bag is enabled is shown. In this embodiment the emptying device 303b is a linear motor comprising a cylinder rod 303c. Because the lifting bag is closed the cylinder rod 303c is retracted/pulled in. The first end of the pulling line 307 is connected to the container 302 i.e. the lower part of the lifting bag and the second end to the rod 303c.

[0033] Figure 3c shows the partly cross-sectional view of the opening and closing system of figure 3b, when the bag is open. As can be seen from figure 3c, when the lifting bag is open, the container 302 is tilted from underneath the upper part of the lifting bag 302 and the rod 303c is obtruded out.

[0034] Figure 4 shows a schematic view of a remote controller 400 and a remotely controllable emptying device 401 of an opening and closing system according to an embodiment of the invention. The remote controller 400 is a handheld device for controlling the remotely controllable emptying device 401 and it comprises a housing 402, a connection module 403 comprising a transmitter and a control circuitry for transmitting control signals to a receiver of the emptying device 401. The transmitter may be a RF transmitter or a Bluetooth wireless transmitter with an antenna. The transmitter comprises a microprocessor chip which is connected to a battery 404 of the remote controller.

[0035] The remote controller 400 comprises two controlling switches, for example, buttons; the first may be a CLOSE button 405 and the second may be an OPEN button 406. The control signal is transmitted on the basis of switch selections of a user. For example, the remote controller 400 transmits a control signal for closing the lifting bag if the CLOSE button 405 is pressed/selected or the remote controller 400 transmits a control signal for opening the lifting bag if the OPEN button 406 is pressed/selected.

[0036] The remotely controllable emptying device 401, a winch in this embodiment, comprises a rotatable drum 407, a motor 408 and an emptying device control module 409. The rotatable drum 407 and the motor 408 are parts of the winch. The motor 408 is drivingly connected to the rotatable drum 407 and selectively connected to an external battery of the opening and closing system, which means that the battery is external to the emptying device. The battery may however be an integrated part of the

emptying device. The pulling line of the opening and closing system is arranged to be wrapped around the drum 407. The emptying device control module 409 connects the battery to the motor 408 and to the remote controller 400. The emptying device control module 409 comprises a receiver, for example, an RF receiver or a Bluetooth wireless receiver with an antenna, and a control circuitry for receiving control signals from the remote controller. The receiver may comprise a microprocessor chip which is connected to the battery. There is a wireless connection 410 between the remote controller 400 and the remotely controllable emptying device 401.

The remote controlled opening and closing system may further comprise a security switch that requires that a lifting bag is lifted from the semi-underground waste container before the opening and closing of the lifting bag is performed. The security switch may be an additional button or corresponding of a remote controller that has to be selected before it is possible to use the emptying device. In other words, a remote controller transmits a control signal for enabling the use of the emptying device when the security switch is selected/pushed. However it is also possible, that the security switch is a mechanical switch (shown in fig. 3a).

[0037] An opening and closing system according to an embodiment of the invention may also comprise a RFID security system. A first part of the RFID security system, a RFID tag/chip, may be arranged to the lower part of a lifting bag and the second part of the RFID security system, a RFID reader, may be arranged to a collection vehicle. For emptying, the lifting bag is lifted and positioned over the collection vehicle, wherein the RFID reader reads the tag of the lifting bag. After this emptying of the lifting bag is enabled.

[0038] Figure 5 shows a flowchart of a method for remotely opening and closing a lifting bag of a semi-underground waste container 500 according to an embodiment of the invention. In step 510 a remote controller receives a switch selection for opening the lifting bag. In step 520, an opening control signal is transmitted from the remote controller to an emptying device. After receiving the opening control signal the emptying device, in step 530, releases the pulling line so that the lower part of the lifting bag opens. The method may further comprise following method steps for closing the lifting bag. In step 540, the remote controller receives a switch selection for closing the lifting bag. In step 550, a closing control signal is transmitted from the remote controller to the emptying device. After receiving the closing control signal the emptying device, in step 560, pulls the pulling line so that the lower part of the lifting bag closes.

[0039] It is obvious that the present invention is not limited solely to the above-presented embodiments, but it can be modified within the scope of the appended claims.

Claims

1. A remote controlled opening and closing system of a lifting bag of a semi-underground waste container (204) for closing and opening the lifting bag (202: 301, 302), wherein the opening and closing system (200) comprises:

a pulling line tube (209),
 a pulling line (201) that is at least partly arranged inside the pulling line tube (209),
 a battery-operated remotely controllable emptying device that is a winch (401) comprising a rotatable drum (407) and a motor (408) that is drivingly connected to said rotatable drum (407),
 a remote controller (400) comprising a selection switch (405) for closing the lifting bag (202: 301, 302) and a selection switch (406) for opening the lifting bag (292) and which remote controller (400) is wirelessly connected to the winch (401) and arranged to transmit control signals to the winch (401) for closing and opening the lifting bag (202: 301, 302) as a result of selection of a switch (405, 406), and

wherein a first end of the pulling line (201) is connected to the lower part of the lifting bag (202: 301, 302) and the second end to the drum (407) of the winch (401), and
 if the selection switch (405) for closing the lifting bag (202: 301, 302) is selected, the winch (401) receives the closing control signal and the pulling line (201) is pulled by the winch (401) so that the pulling line (201) wraps around the drum (407) and the lifting bag (202: 301, 302) closes, and
 if the selection switch (406) for opening the lifting bag (202: 301, 302) is selected the winch (401) receives the opening control signal and the pulling line (201) is released by the winch (401) so that the pulling line (201) un-wraps from the drum (407) and the lower part of the lifting bag (201) opens.

2. A remote controlled opening and closing system according to claim 1, wherein the lifting bag (202) is a soft lifting bag and the first end of the pulling line (201) is connected around the lower part of the lifting bag (202), and for closing the lifting bag (202), the pulling line (201) is pulled so that first end of the pulling line (201) compresses around the lower part of the lifting bag (202), and for emptying the lifting bag (202), the pulling line (201) is released so that the compression of the first end of the pulling line (201) around the lower part of the lifting bag (202) releases.

3. A remote controlled opening and closing system ac-

cording to claim 1 or 2, wherein the lower part of the lifting bag is a container (302) and the first end of the pulling line (201) is connected to the container (302), and for closing the lifting bag, the pulling line (201) is pulled so that the container (302) tilts underneath the upper part (301) of the lifting bag, and for emptying the lifting bag, the pulling line (201) is released so that the container (302) tilts away underneath the lifting bag.

4. A remote controlled opening and closing system according to any of claims 1 to 3, wherein the pulling line (201) is a polypropylene rope.

5. A remote controlled opening and closing system according to any of claims 1 to 4, wherein the pulling line tube (209) is a flexible hydraulic hose.

6. A remote controlled opening and closing system according to any of claims 1 to 5, wherein the remote controlled opening and closing system (200) comprises a solar cell (210).

7. A remote controlled opening and closing system according to any of claims 1 to 6, wherein the lower part of the lifting bag (202: 301, 302) comprises a RFID tag arranged to be read by a RFID reader of a collection vehicle before opening of the lifting bag (202: 301, 302) is enabled.

8. A method for closing and opening a lifting bag (202: 301, 302) of a semi-underground waste container (204) by a remote controlled opening and closing system (200) comprising a remote controller (400) comprising a selection switches (405, 406) for closing and opening the lifting bag (202: 301, 302), a battery-operated remotely controllable emptying device that is a wince (401) comprising a rotatable drum (407) and a motor (408) that is drivingly connected to said rotatable drum (407), and a pulling line (201), wherein a first end of the pulling line (201) is connected to the lower part of the lifting bag (202: 301, 302) and the second end of the pulling line (201) is connected to the drum (407) of the wince (401), the method comprises:

receiving a switch (406) selection for opening the lifting bag (202: 301, 302) by the remote controller (400),

transmitting an opening control signal from the remote controller (400) to the wince (401), and releasing the pulling line (201) by the wince (401) so that the pulling line (201) wrapped around the drum (407) un-wraps from the drum (407) and the lower part of the lifting bag (202: 301, 302) opens.

9. A method according to claim 8, wherein the method

further comprises

receiving by the remote controller (400) a switch (405) selection for closing the lifting bag (202: 301, 302),

transmitting an opening control signal from the remote controller (400) to the wince (401), and pulling the pulling line (201) by the wince (401) so that the pulling line (201) wraps around the drum (407) and the lifting bag (202: 301, 302) closes.

10. A method according to any of claims 8 to 9, wherein the lifting bag (202: 301, 302) is lifted from the semi-underground waste container (204) before opening the lifting bag (202: 301, 302).

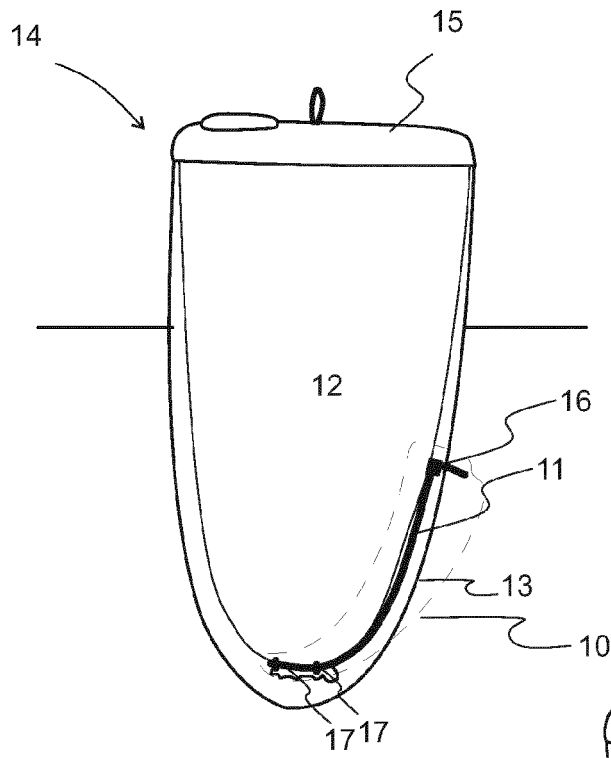


Fig. 1a

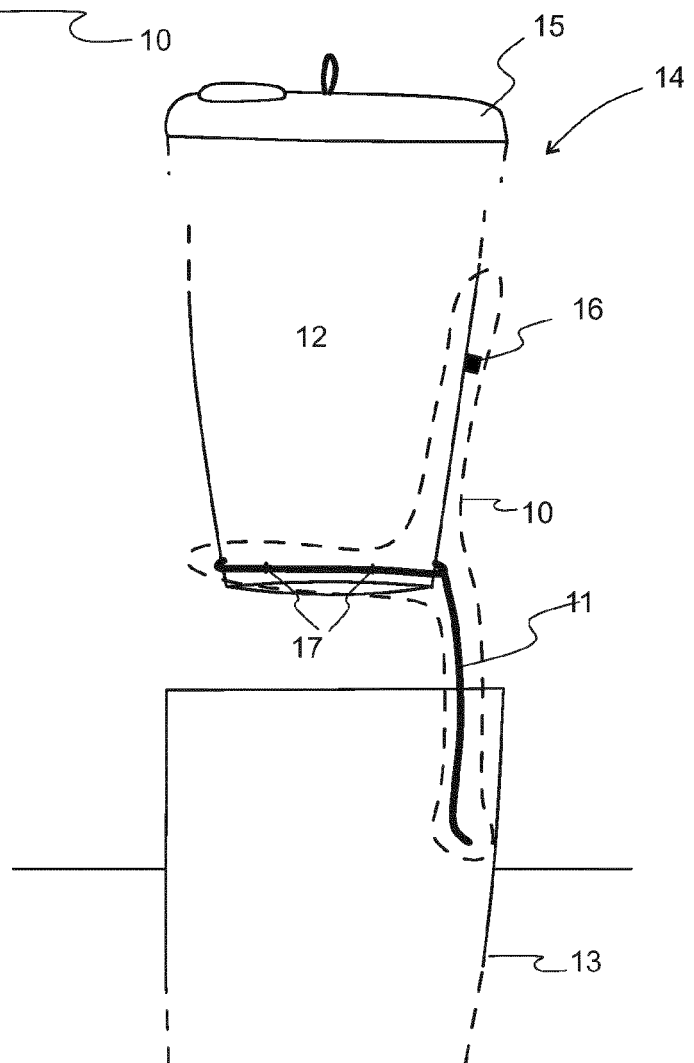


Fig. 1b

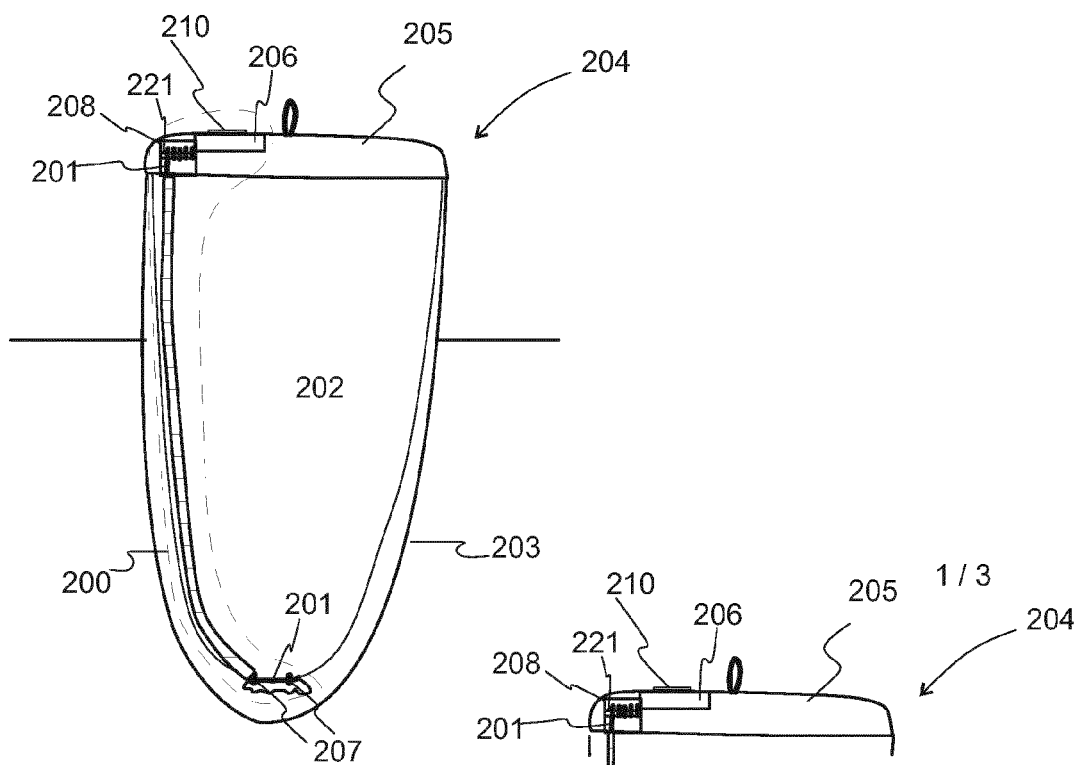


Fig. 2a

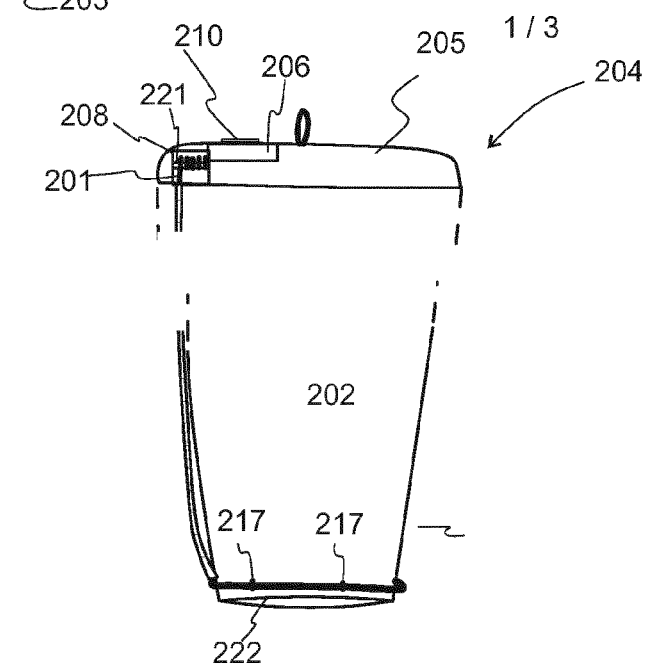


Fig. 2b

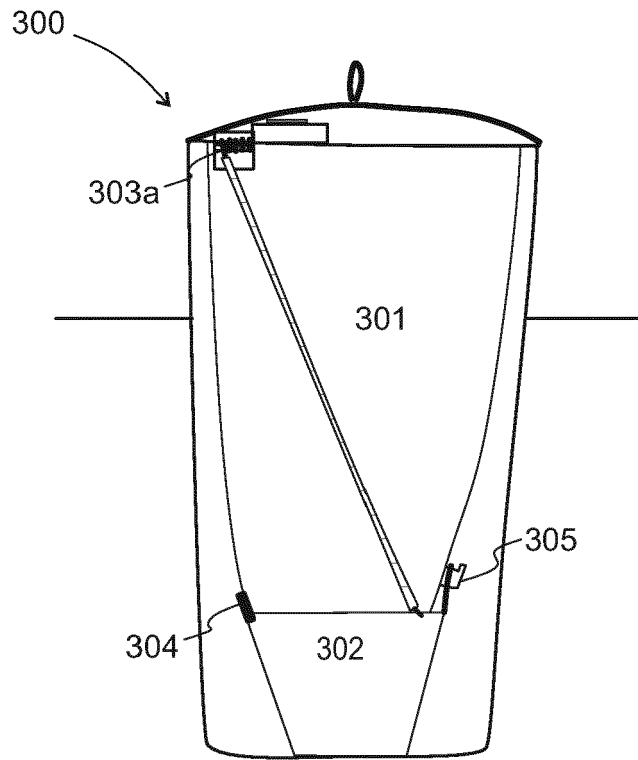


Fig. 3a

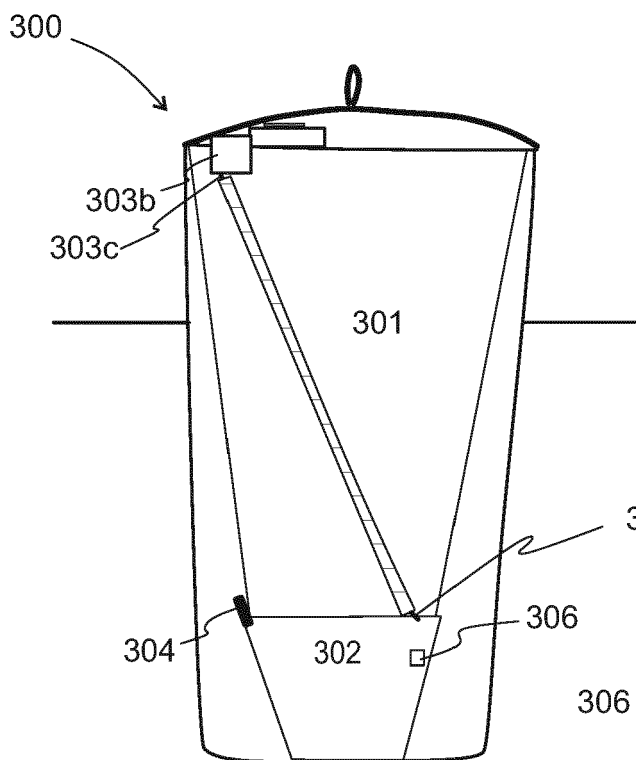


Fig. 3b

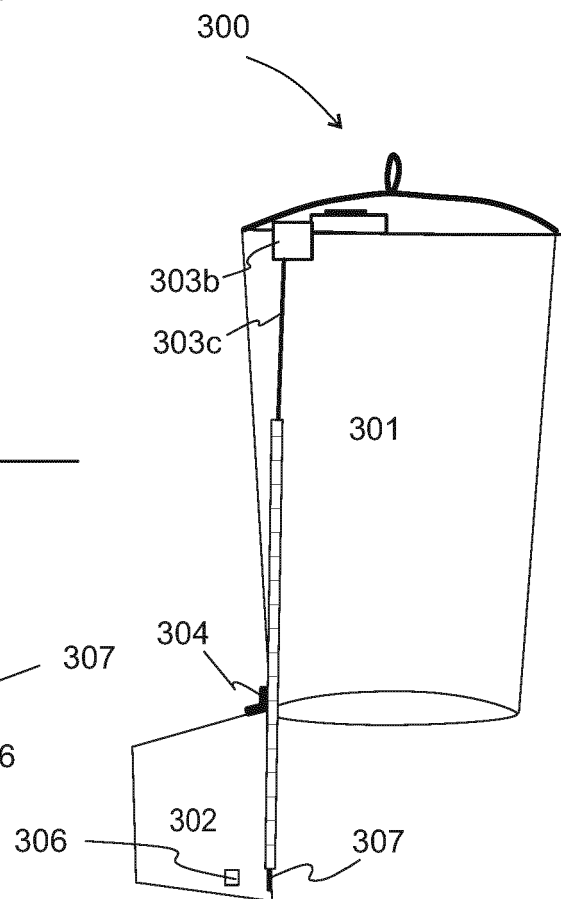


Fig. 3c

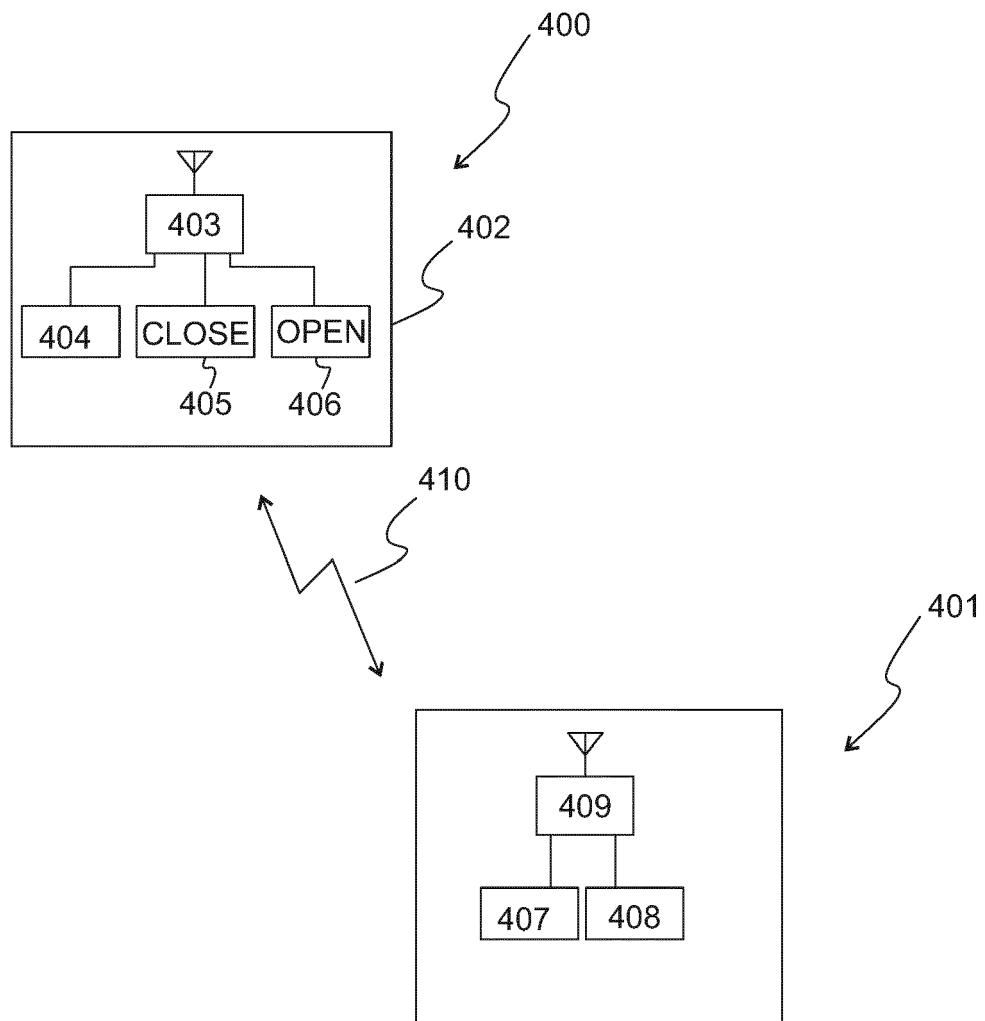


Fig. 4

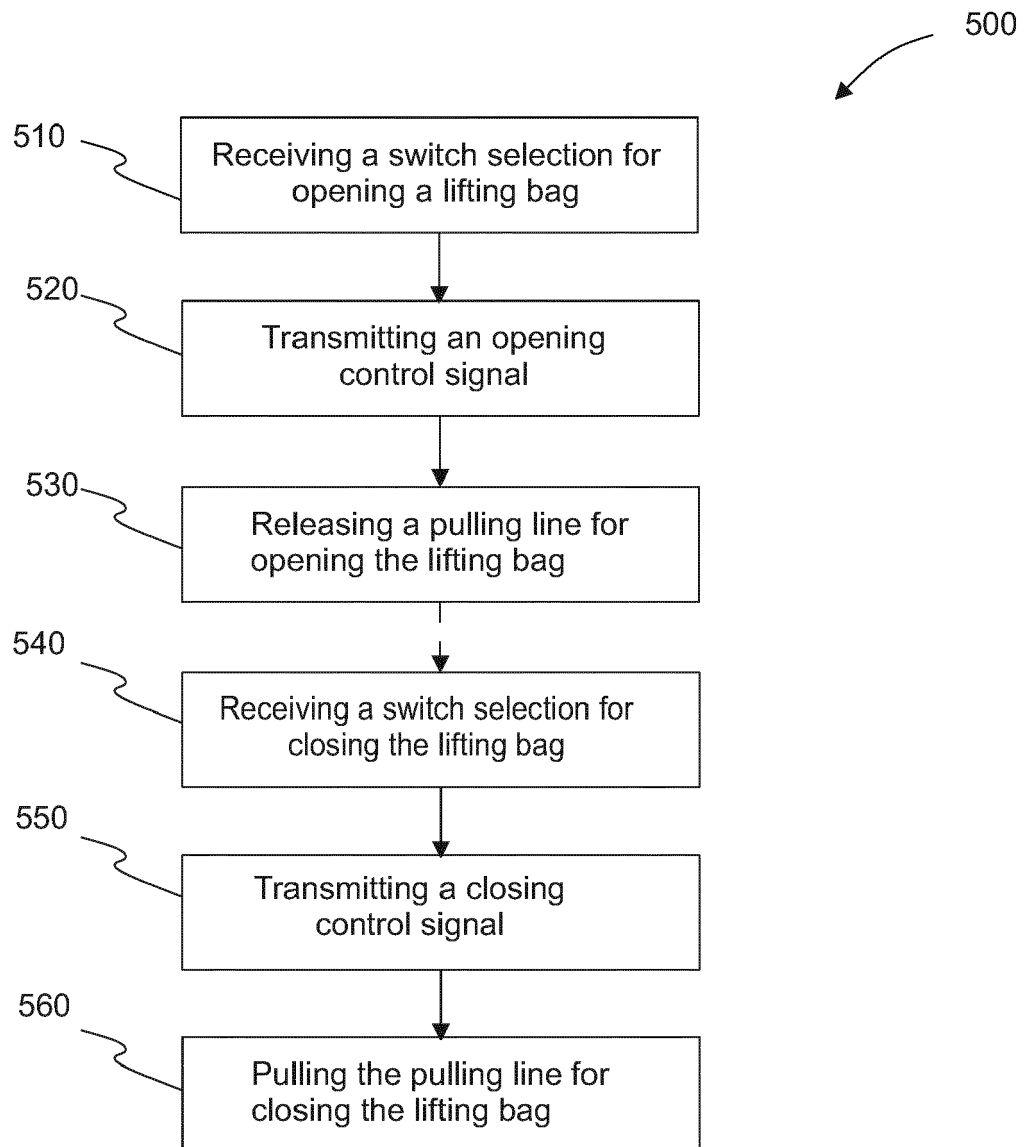


Fig. 5



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Application Number
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Place of search The Hague		Date of completion of the search 2 March 2018	Examiner Smolders, Rob
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