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(54) A VEHICLE AND A METHOD FOR COLLECTING AN ELONGATED FLEXIBLE ELEMENT

(57) A vehicle (100) according to the invention for collecting a elongated flexible element (10) that has been laid out on a terrain comprises a support frame (20) configured to support a winding assembly (200) for the elongated flexible element (10), whereby the support frame is configured to be movable across the terrain; and an actuator (250) configured for actuating the winding assembly (200) for winding the elongated flexible element (10), thereby pulling the vehicle (100) in a forward movement across the terrain along the elongated flexible element (10).

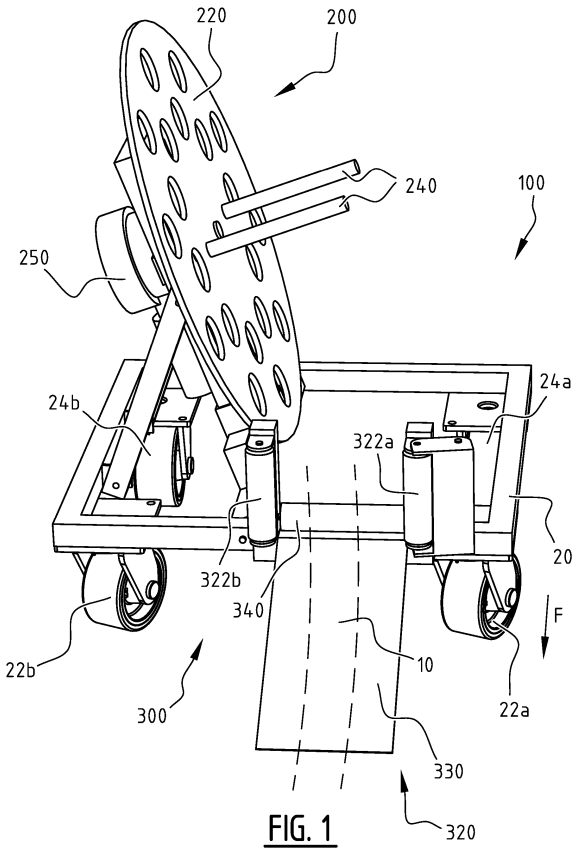

FIG. 1

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Description

Field of Invention

[0001] The field of the invention relates to a vehicle for collecting an elongated flexible element. The field of the invention further relates to a method for collecting an elongated flexible element on the vehicle according to the present invention.

Background

[0002] It is generally known to collect an elongated flexible element, such as a fire hose, by winding the hose, such as winding in a roll, after said hose has been used. Commonly the fire hose, when laid out on the ground, may still contain water. In a known method to collect the fire hose, the first hose is first compressed along its length by moving a device along the fire hose to remove the water from the hose. In a next step a loose end of the fire hose is attached to a winding device, which has a winding assembly to collect the hose in a roll around a rod. The winding assembly including the rod is rotated to pull the fire hose towards the winding device to wind the hose around said rod. Due to the pulling of the fire hose across the terrain, the fire hose will take up any dirt from the terrain. Moreover, the pulling of the fire hose over the terrain demands considerable force and time in order to collect the fire hose.
In alternative methods the winding assembly is mounted on a motorized vehicle, which motorized vehicle has wheels driven by a motor to move the motorized vehicle in a certain direction while collecting the fire hose. However, said motorized vehicle is relatively heavy and the direction of the movement of the motorized vehicle must be controlled by a driver or operator.

Summary

[0003] Embodiments of the invention aim to improve a vehicle and a method for collecting an elongated flexible element. Particular embodiments aim to provide a vehicle which is capable of collecting the elongated flexible element in a compact form in a fast and simple way. Particular embodiments aim to provide a vehicle and a method for collecting an elongated flexible element, such as a hose, without moving the elongated flexible element across the terrain, on which the elongated flexible element is laid out.

[0004] According to a first aspect of the invention there is provided a vehicle for collecting an elongated flexible element that has been laid out on a terrain, the vehicle comprising:

- a support frame configured to support a winding assembly for the elongated flexible element; whereby the support frame is configured to be movable across the terrain; and
- an actuator configured for actuating the winding assembly for winding the elongated flexible element, thereby pulling the vehicle in a forward movement across the terrain along the elongated flexible element.

[0005] According to another aspect of the invention there is provided a method for operating the vehicle according to any one of the one of the preceding claims, the method comprising the steps of:

- Attaching a elongated flexible element to the winding assembly, which elongated flexible element is laid out on a terrain;
- Controlling the actuator to actuate the winding assembly for winding the elongated flexible element, thereby pulling the vehicle in a forward movement along the elongated flexible element;
- Allowing the vehicle to follow the elongated flexible element while pulling the vehicle along the elongated flexible element.

[0006] The elongated flexible element, such as a hose, is winded on the winding assembly when actuated by the actuator. The elongated flexible element may be winded as a roll or in any other suitable winding form. The vehicle is configured for moving in a forward movement across the terrain along the elongated flexible element in response to the pulling of the winding assembly on the elongated flexible element while winding the elongated flexible element.
In an example, the elongated flexible element laid out on the terrain provides a suitable friction force with respect to the terrain such that the elongated flexible element is substantially stationary while the vehicle is pulled across the terrain along the elongated flexible element. In an example, a hose, especially when at least partly filled with a fluid, may provide a suitable friction force with respect to the terrain.
In this way, the vehicle is moved along the elongated flexible element to follow the position of the elongated flexible element on the terrain. Therefore, the vehicle does not need an active control for steering along the elongated flexible element. As such, the vehicle may in a fast and simple way wind the elongated flexible element while following the position of the elongated flexible element across the terrain.
In exemplary embodiments, the elongated flexible element may be a hose, may be a cable, may be a rope and may be any other suitable elongated flexible element.

[0007] In an exemplary embodiment, the vehicle comprises a steering mechanism configured for steering the vehicle along the elongated flexible element, when the vehicle is pulled in the forward movement along the elongated flexible element by the actuator, in response to a force of the elongated flexible element acting on the steering mechanism. In particular, the steering mechanism steers the vehicle along the elongated flexible ele-

ment in response to a force of the elongated flexible element acting in a lateral direction on the steering mechanism.

[0008] In an exemplary embodiment, the steering mechanism comprises a guiding assembly configured for guiding the elongated flexible element to the winding assembly.

In an exemplary embodiment, said guiding assembly comprises a first guiding element arranged at a first lateral side of the elongated flexible element and a second guiding element arranged at a second lateral side of the elongated flexible element opposite to the first lateral side of the elongated flexible element.

The elongated flexible element is guided by the guiding assembly to the winding assembly. On one side, when the elongated flexible element engages against the first guiding element, a force of the elongated flexible element urges the support frame in a lateral direction away from the first lateral side of the elongated flexible element by means of the guiding assembly. In an example, the force acts towards a left side of the support frame. On the other side, when the elongated flexible element engages against the second guiding element, a force of the elongated flexible element urges the support frame in a lateral direction away from the second lateral side of the elongated flexible element by means of the guiding assembly. In an example, the force acts towards a right side of the support frame.

The first guiding element and the second guiding element may be separate elements. Alternatively, the first guiding element and the second guiding element may be parts of a common member, such as a yoke.

[0009] In an exemplary embodiment, the guiding assembly is coupled to a forward side of the support frame. The forward side is defined as the side of the support frame in which the vehicle will move when the vehicle is pulled in a forward direction along the elongated flexible element. The coupling may be directly or may be indirectly via one or more intermediate elements. The coupling to the forward side supports a direct steering of the forward side of the support frame. In particular, a steering force provided by the guiding assembly may be increased by increasing a distance of the guiding assembly with respect to a common rotation point of the vehicle.

[0010] In an exemplary embodiment, said vehicle comprises at least one steering roller configured for steering the winding vehicle along the elongated flexible element in response to a force of the elongated flexible element acting in a lateral direction on the steering mechanism.

The at least one steering roller is configured for steering the vehicle along the elongated flexible element in response to a force of the elongated flexible element acting on the steering mechanism, for exampling by means of a force of the elongated flexible element acting on the first guiding element and the second guiding element, respectively, of the guiding assembly.

[0011] In an exemplary embodiment, the at least one steering roller is arranged at the forward side of the support frame. The coupling at the forward side supports an easy steering of the forward side of the support frame. In particular, the position of the at least one steering roller at the forward side of the support frame arranges a common rotation point of the vehicle at a rear side of the support frame opposite to the forward side of the support frame.

[0012] In an exemplary embodiment, the at least one steering roller comprises a first steering roller arranged at a left side of the guiding assembly and a second steering roller arranged at a right side of the guiding assembly. The embodiment supports a proper balancing of the support frame while steering the support frame along the elongated flexible element.

[0013] In an exemplary embodiment, each steering roller comprises a caster mechanism configured for allowing a caster movement of the steering roller. The embodiment supports a fast and simple steering of the support frame.

[0014] In an exemplary embodiment, the guiding assembly has a gap width which is selected to accommodate a width of the elongated flexible element. In particular, the elongated flexible element may be accommodated in a gap between a first guiding element which is arranged at a first lateral side of the elongated flexible element, e.g. a left side of the elongated flexible element, and a second guiding element which is arranged at a second lateral side of the elongated flexible element, e.g. a right side of the elongated flexible element, which is opposite to the first lateral side of the elongated flexible element.

In a particular example, the gap width of the guiding assembly is between 1.00 and 1.25 times the width of the elongated flexible element. In general, a gap width being substantially equal to the width of the elongated flexible element supports a fast response time of the vehicle to follow the elongated flexible element across the terrain. A width of the elongated flexible element may be a width in a substantially flat condition, such as a hose when the hose at the guiding assembly is substantially emptied, and may be a width in a substantially round condition, such as a hose when the hose at the guiding assembly is substantially filled with fluid.

[0015] In an exemplary embodiment, each of the first guiding element and the second guiding element comprises a roller configured for rotatably guiding the elongated flexible element to the winding assembly. A rotatable guiding of the elongated flexible element to the winding assembly reduces friction forces for collecting the elongated flexible element on the winding assembly.

[0016] In an exemplary embodiment, the vehicle has a weight such that the vehicle is pulled towards the elongated flexible element when the actuator rotates the winding assembly to wind the elongated flexible element, wherein preferably the weight of the vehicle is at most 20 kg, preferably at most 15 kg.

[0017] In an exemplary embodiment, the vehicle is supported on the terrain by at least three rollers, including

any steering rollers, wherein the at least three rollers is configured to control a rolling resistance of the at least three rollers such that the vehicle is allowed to move in a forward direction along the elongated flexible element when pulling onto the elongated flexible element. In particular, at least one attribute of the at least three rollers, such as perimeter, width, number and material, is selected to minimize the rolling resistance of the at least three rollers.

In a particular embodiment, each of the at least three rollers has a perimeter of at least 100 mm.

[0018] In an alternative embodiment, the vehicle is supported on the terrain by supporting means, wherein the supporting means is configured to control a resistance of supporting means with respect to the terrain such that the vehicle is allowed to move in a forward direction along the elongated flexible element when pulling onto the elongated flexible element. In an example, the supporting means are sliding runners which provide a smooth interface to a relatively low friction terrain, such as snow, sand or wet grass.

[0019] In an exemplary embodiment, the guiding assembly further comprises a guiding plate arranged for elevating the elongated flexible element from the terrain upwards to the support frame. In particular, the guiding plate arranged for elevating the elongated flexible element from the terrain upwards to the gap of the guiding assembly. In a particular embodiment, the guiding plate arranged for elevating the elongated flexible element, such as a hose, from the terrain upwards in order to remove any fluids from the elongated flexible element. In an example, by using the gravitation force the fluids may be removed from a hose by raising the hose upwards from the terrain.

[0020] In an exemplary embodiment, the winding assembly comprises a flange plate and at least one rod protruding from the flange plate for collecting the elongated flexible element, such as in a roll, around the at least one rod, wherein the flange plate is arranged for positioning the elongated flexible element in a lateral direction on the at least one rod. In a particular example, the elongated flexible element is winded on the rod while being arranged adjoined to the flange plate. As such, the lateral position of the elongated flexible element on the rod is substantially constant for each winding part of the winded elongated flexible element. Additionally, a width of the winded elongated flexible element, such as a roll, is substantially equal to the width of the elongated flexible element.

[0021] In an exemplary embodiment, the actuator is configured for rotating the winding assembly in a rotating direction such that the elongated flexible element is winded on the at least one rod, thereby pulling the vehicle in a forward movement across the terrain along the elongated flexible element, when the elongated flexible element is laid out on the terrain.

[0022] In an exemplary embodiment, the winding assembly further comprises a retaining element arranged for retaining a loose part of the elongated flexible element onto the winding assembly. Said retaining element may be a clamp, may be a pin, may be a tape, may be a strap and may be any other suitable element.

[0023] In an exemplary embodiment, the vehicle comprises a brake mechanism configured for controlling a braking force acting on at least one roller configured for rollably supporting the support frame. The brake mechanism may be configured to prevent a free rolling of the vehicle on a terrain having a slope. In particular, the braking mechanism may comprise at least one of a spring element, a friction element, a force adjusting element and a lever. The braking force of the brake mechanism may be mechanically adjusted before operating the vehicle to collect the elongated flexible element.

[0024] In an exemplary embodiment, the guiding assembly further comprises a support roller member arranged for supporting the elongated flexible element between the first guiding element and the second guiding element, the support roller member being configured for rotatably guiding the elongated flexible element to the winding assembly. A rotatable guiding of the elongated flexible element to the winding assembly reduces friction forces for collecting the elongated flexible element on the winding assembly.

[0025] In an exemplary embodiment, the guiding assembly further comprises a width adjusting mechanism configured to adjust a gap of the guiding assembly for accommodating a width of the elongated flexible element.

In an exemplary embodiment, the width adjusting mechanism is configured for arranging a third guiding element in an intermediate position between the first guiding element and the second guiding element in order to adjust the gap.

[0026] In an exemplary embodiment, the width adjusting mechanism is configured for rotatably moving the third guiding element between a standby position and the intermediate position.

In an exemplary embodiment, the width adjusting mechanism is coupled to one of the first guiding element and the second guiding element for rotatably moving the third guiding element about said one of the first guiding element and the second guiding element between the standby position and the intermediate position. In particular, the width adjusting mechanism may be coupled to an axle of the one of the first guiding element and the second guiding element.

[0027] In an exemplary embodiment, the winding assembly in an operational position is arranged at an acute angle with respect to a horizontal plane for positioning the elongated flexible element in the lateral direction on the winding assembly. In particular, the acute angle of the winding assembly supports a simple biasing of the elongated flexible element in a lateral direction on the winding assembly by using the gravity force for biasing the elongated flexible element in the lateral direction. Preferably, the acute angle is between 60 degrees and

85 degrees with respect to the horizontal plane.

[0028] In an exemplary embodiment, the winding assembly is moveably arranged between the operational position for winding the elongated flexible element and a collapsed position, wherein the winding assembly is at least partly accommodated by the support frame. The collapsed position provides an easy and compact transport of the vehicle after use of the vehicle for collecting the elongated flexible element. The winded elongated flexible element may be removed from the winding assembly after winding the elongated flexible element.

In an exemplary embodiment, the vehicle comprises a first support yoke mounting the winding assembly onto the support frame, wherein the first support yoke is rotatably coupled by a first connection to the support frame and is rotatably coupled by a second connection to the winding assembly.

[0029] In an exemplary embodiment, the vehicle comprises a second support yoke coupled to the support frame for retaining the winding assembly in the operational position of the winding assembly.

In an exemplary embodiment, the second support yoke is moveably coupled to the support frame for a movement between a support position for retaining the winding assembly in the operational position and a collapsed position with respect to the support frame.

The first support yoke and the second support yoke support an easy movement of the winding assembly between the operational position for winding the elongated flexible element and a collapsed position, wherein the winding assembly is at least partly accommodated by the support frame.

[0030] In an exemplary embodiment, the vehicle is connected to a user control module configured for controlling the actuator, wherein the user control module is remotely arranged from the vehicle.

In an exemplary embodiment, the user control module is a handheld module, which is connected to the actuator via a wired connection or via a wireless connection.

The user may control the actuator from a distance. In this way, the user does not need to move together with the vehicle while moving the vehicle across the terrain along the hose.

[0031] In an exemplary embodiment, the vehicle further comprises a battery unit for energising the actuator.

Brief description of the figures

[0032] The accompanying drawings are used to illustrate presently preferred non-limiting exemplary embodiments of devices of the present invention. The above and other advantages of the features and objects of the invention will become more apparent and the invention will be better understood from the following detailed description when read in conjunction with the accompanying drawings, in which:

FIG. 1 illustrates schematically a perspective front view of an exemplary embodiment of the vehicle according to an exemplary embodiment;

FIG. 2 illustrates schematically a perspective side view of the exemplary embodiment of the vehicle shown in FIG. 1.

FIG. 3 shows in a front perspective view a guiding assembly of a vehicle according to an exemplary embodiment of the invention.

FIGS. 4A - 4F show a vehicle and a method for collapsing said vehicle according to an exemplary embodiment of the present invention.

Description of embodiments

[0033] FIG. 1 illustrates schematically the perspective front view of an exemplary embodiment of the vehicle according to an exemplary embodiment. The vehicle 100 comprises a support frame 20, a winding assembly 200, an actuator 250 and a steering mechanism 300.

[0034] The support frame 20 is a square shaped frame, which is rotatably supported by two steering rollers 22a, 22b and two back rollers 24a, 24b. The two steering rollers 22a, 22b are mounted on the square shaped frame at a forward side of the support frame 20 in a direction F. The two back rollers 24a, 24b are mounted on the square shaped frame at a backward side of the support frame 20 opposite to the direction F, as also indicated in a perspective side view FIG. 2.

[0035] Each steering roller 22a, 22b comprises a caster mechanism configured for allowing a caster movement of the steering roller 22a, 22b. In this way, the steering roller 22a, 22b may easily rotate around a steering axis arranged perpendicular to the terrain to adjust the forward rolling direction of the steering roller across the terrain.

[0036] As show in FIG. 2, the actuator 250 is coupled to the winding assembly 200 for rotating the winding assembly 200 such that an attached hose 10 or a cable or any other elongated flexible element may be winded by the winding assembly 200, such as winded in a roll. The actuator 250 rotates the winding assembly 200 in a rotating direction R to wind the hose by the winding assembly 200.

[0037] The steering mechanism 300 of the vehicle 100 comprises a guiding assembly comprising a first guiding element 322a and a second guiding element 322b. The guiding assembly is coupled to the support frame 20 at the forward side of the support frame 20. The guiding assembly is arranged for guiding the hose 10 towards the winding assembly 200. The first guiding element 322a is arranged for guiding a first lateral side of the hose and the second guiding element 322b is arranged for guiding a second lateral side of the hose opposite to the first lateral side of the hose 10.

[0038] Each of the first guiding element 322a and the second guiding element 322b comprise a roller configured for rotatably guiding the hose 10 to the winding assembly 200. The rollers provide a relatively low friction

while guiding the hose 10 to the winding assembly 200.

[0039] The guiding element 322a and the second guiding element 322b are arranged at a predetermined distance between one another such that a gap is provided for accommodating a width of the hose 10. The gap of the guiding assembly between the guiding element 322a and the second guiding element 322b is suitably selected according to a width of the hose 10.

[0040] The guiding assembly further comprises a guiding plate 330 arranged for elevating the hose 10 from the terrain upwards to the gap between the first guiding element 322a and the second guiding element 322b..

[0041] The guiding assembly further comprises a support roller member 340 arranged for supporting the hose 10 across the gap between the first guiding element 322a and the second guiding element 322b. The support roller member 340 is configured for rotatably guiding the hose 10 to the winding assembly 200. The support roller member 340 provides a relatively low friction while guiding the hose 10 to the winding assembly 200. The support roller member 340 may be a single roller or may comprise a plurality of rollers arranged adjacent to each other to rollably guide the hose 10 to the winding assembly 200.

[0042] As shown in FIG. 1, the winding assembly 200 comprises a flange plate 220 and a number of rods 240, each rod protruding from the flange plate 220. Each rod is arranged substantially perpendicular to the flange plate 220. The number of rods may be one rod or may be two rods or may be at least three rods protruding from the flange plate220. The rods are arranged for receiving the hose when winding the hose around the number of rods. In an example, the hose 10 may be winded around one rod and may be winded around at least two rods. In this way the hose is collected in a condensed shape, such as a roll. The flange plate 220 is shaped and arranged to position the hose 10 on the at least one rod 240, when winding the hose on the at least one rod 240.

[0043] In the embodiment shown, the winding assembly 200 comprises two rods each located offset with respect to an axis of rotation of the winding assembly 200. The two rods 240 are cooperatively used to attach a loose end of the hose. In an example, a hose 10 may be double folded before a double folded end of the hose is attached to the two rods 240.

[0044] The flange plate 220 is arranged in an operational position at an acute angle with respect to a horizontal plane of the support frame 20. In the example shown the acute angle is between 85 and 60 degrees with respect to the horizontal plane of the support frame 20. Due to the acute angle a hose 10 will be biased by the gravity towards the flange plate 220 while being winded about the two rods 240. In this way, the hose 10 is positioned by the flange plate 220 on the two rods 240 in a lateral direction of the rods 240. As a result the hose 10 may be winded on the two rods 240 while covering an already winded part of the hose. In particular, the hose 10 may be winded in a compact way having a winding width on the rods 240 being substantially equal to a width of the hose 10.

[0045] In an alternative embodiment, the winding assembly 220 may be configured to wind the elongated flexible element 10, such as a hose or a cable, on the rods 10 while moving the elongated flexible element 10 in a lateral direction along the rods 240.

[0046] Additionally, the winding assembly 200 may comprise a first flange plate and a second flange plate cooperatively enclosing the at least one rods 240 to retain the elongated flexible element 10 on the rods 240 between the first flange plate and the second flange plate.

[0047] FIG. 3 shows in a front perspective view a guiding assembly of a vehicle according to an exemplary embodiment of the invention. The FIG. 3 shows a modified guiding assembly of a vehicle shown in FIG. 1 and 2.

[0048] The guiding assembly comprises a width adjusting mechanism 360 configured to adjust a gap of the guiding assembly for accommodating a width of the elongated flexible element, such as a hose. In particular, the width adjusting mechanism 360 is configured for arranging a third guiding element 322c in an intermediate position between the first guiding element 322a and the second guiding element 322b in order to adjust the gap for accommodating a width of the hose 10.

[0049] In the initial state, the initial gap W1 is formed between the first guiding element 322a and the second guiding element 322b.

[0050] In the embodiment shown, the width adjusting mechanism 360 is configured for rotatably moving the third guiding element 322c between a standby position, which is outside the gap W1, and the intermediate position, as shown in FIG.3. In the adjusted state as shown, the adjusted gap W2 is formed between the third guiding element 322c and the second guiding element 322b. The adjusted gap W2 is smaller than the initial gap W1.

[0051] The width adjusting mechanism 360 is coupled to the first guiding element 322a, in particular to an axle of the first guiding element 322a, for rotatably moving the third guiding element 322c about an axis A of said first guiding element 322a between the standby position and the intermediate position.

[0052] Alternatively, the width adjusting mechanism 360 may be coupled to the second guiding element 322b, in particular to an axle of the second guiding element 322b, for rotatably moving the third guiding element 322c about said second guiding element 322b between the standby position and the intermediate position.

[0053] A person skilled in the art may contemplate alternative embodiments, wherein the width adjusting mechanism 360 is coupled to another axle element for rotatably moving the third guiding element 322c about said axle element between the standby position and the intermediate position.

[0054] In alternative embodiments, the width adjusting mechanism 360 may be configured for moving at least one of the first guiding element 322a and the second guiding element 322b in order to adjust the gap for accommodating a width of the hose 10.

[0055] FIGS. 4A - 4F show a vehicle and a method for collapsing said vehicle according to an exemplary embodiment of the present invention. The vehicle may be any of the vehicles shown in FIGS. 1 and 2 or FIG. 3.

[0056] The vehicle 400 comprises the support frame 20, the winding assembly 200, the actuator 250 and the steering mechanism 300 as shown in FIGS. 1 and 2. The winding assembly 200 is moveably arranged between the operational position for winding the hose and a collapsed position, wherein the winding assembly 200 is at least partly accommodated by the support frame 20.

[0057] In the embodiment shown, the vehicle 400 comprises a first support yoke 410 mounting the winding assembly 200 onto the support frame 20, wherein the first support yoke 410 is rotatably coupled by a first connection 412 to the support frame 20 and is rotatably coupled by a second connection 414 to the winding assembly 200.

[0058] The vehicle 400 further comprises a second support yoke 420 coupled to the support frame 20 for retaining the winding assembly 200 in the operational position of the winding assembly 200.

[0059] The second support yoke 420 is moveably coupled to the support frame 20 for a movement between a support position in which the second support yoke 420 protrudes upwards from the support frame 20, as shown in FIG. 4A and 4B for retaining the winding assembly 200 in the operational position and a collapsed position with respect to the support frame 20. As shown in FIG. 4C and 4D, the collapsed position is in this embodiment a downward position of the second support yoke 420 with respect to the support frame 20.

[0060] In the method the winding assembly 200 is in a first step released from the second support yoke 420 as shown in FIG. 4A by rotating the first support yoke 410 about the first connection 412 to move the winding assembly 200 upwards.

[0061] In a next step, as shown in FIG. 4C, the second support yoke 420 is rotatably moved from the support position in which the second support yoke 420 protrudes upwards from the support frame 20, as shown in FIG. 4A, to the collapsed position which is a downward position of the second support yoke 420 with respect to the support frame 20.

[0062] In a next step, as shown in FIG. 4D, the first support yoke 410 is rotated about the first connection 412 to position the winding assembly 200 above the first support yoke 410. Additionally, the winding assembly 200 is rotated about the second connection 414 to arrange the flange plate 220 substantially parallel to the horizontal plane of the support frame 20 as indicated by arrow H.

[0063] In a next step, as shown in FIG. 4E, the first support yoke 410 is rotated about the first connection 412 to position the winding assembly 200 in a center position above an opening of the support frame 20. Additionally, the winding assembly 200 is rotated about the second connection 414 to maintain the flange plate 220 substantially parallel to the horizontal plane of the support frame 20.

[0064] In a next step, as shown in FIG. 4F, the winding assembly 200 is lowered to be at least partly accommodated by the support frame 20 while the flange plate 220 is maintained substantially parallel to the horizontal plane of the support frame 20.

[0065] In this way, the vehicle 400 is compacted in a simple way by arranging the winding assembly 200 to be at least partly accommodated by the support frame 20.

[0066] In all of the embodiments shown, the vehicle is connected to a user control module configured for controlling the actuator, wherein the user control module is remotely arranged from the support frame.

[0067] Additionally, the user control module may be a handheld module, which is connected to the actuator via a wired connection or via a wireless connection.

[0068] In all of the embodiments shown, the vehicle may further comprise a battery unit 260 for energising the actuator. The battery unit may be mounted onto the support frame.

[0069] Alternatively, the actuator may be energised by a power unit connect to the actuator via a wired connection and remotely arranged from the vehicle.

[0070] In all of the embodiments shown, the vehicle may be configured to collect any other elongated flexible element instead of a hose, which elongated flexible element is suitable to be winded on the winding assembly.

[0071] It should be appreciated by those skilled in the art that any block diagrams herein represent conceptual views of illustrative units or modules embodying the principles of the invention.

[0072] Whilst the principles of the invention have been set out above in connection with specific embodiments, it is to be understood that this description is merely made by way of example and not as a limitation of the scope of protection which is determined by the appended claims.

Claims

1. A vehicle for collecting a elongated flexible element, such as a hose, that has been laid out on a terrain, the vehicle comprising:

   - a support frame configured to support a winding assembly for the elongated flexible element; whereby the support frame is configured to be movable across the terrain; and
   - an actuator configured for actuating the winding assembly for winding the elongated flexible element, thereby pulling the vehicle in a forward movement across the terrain along the elongated flexible element.

2. The vehicle according to claim 1, wherein the vehicle comprises a steering mechanism configured for steering the vehicle along the elongated flexible element, when the vehicle is pulled in the forward

movement along the elongated flexible element by the actuator, in response to a force of the elongated flexible element acting on the steering mechanism;
wherein preferably the steering mechanism comprises a guiding assembly configured for guiding the elongated flexible element to the winding assembly;
more preferably said guiding assembly comprising a first guiding element arranged at a first lateral side of the elongated flexible element and a second guiding element arranged at a second lateral side of the elongated flexible element opposite to the first lateral side of the elongated flexible element, wherein the guiding assembly is coupled to a forward side of the support frame.

3. The vehicle according to claim 2, wherein said vehicle comprises at least one steering roller configured for steering the vehicle across the terrain along the elongated flexible element in response to a force of the elongated flexible element acting in a lateral direction on the steering mechanism;
wherein preferably the at least one steering roller is arranged at the forward side of the support frame and comprises a first steering roller arranged at a left side of the guiding assembly and a second steering roller arranged at a right side of the guiding assembly;
wherein more preferably each steering roller comprises a caster mechanism configured for allowing a caster movement of the steering roller.

4. The vehicle according to claim 2 or 3, wherein each of the first guiding element and the second guiding element comprises a roller configured for rotatably guiding the elongated flexible element to the winding assembly.

5. The vehicle according to any one of the preceding claims, wherein the vehicle has a weight such that the vehicle is pulled towards the elongated flexible element when the actuator rotates the winding assembly to wind the elongated flexible element,
wherein preferably the weight of the vehicle is at most 20 kg, preferably at most 15 kg.

6. The vehicle according to any one of claims 2 - 4, wherein the guiding assembly further comprises a guiding plate arranged for elevating the elongated flexible element from the terrain upwards to the support frame.

7. The vehicle according to any one of claims 2 - 4, wherein the guiding assembly further comprises a support roller member arranged for supporting the elongated flexible element between the first guiding element and the second guiding element, the support roller member being configured for rotatably guiding the elongated flexible element to the winding assembly.

8. The vehicle according to any one of claims 2 - 4, wherein the guiding assembly further comprises a width adjusting mechanism configured to adjust a gap of the guiding assembly for accommodating a width of the elongated flexible element;
wherein preferably the width adjusting mechanism is configured for arranging a third guiding element in an intermediate position between the first guiding element and the second guiding element in order to adjust the gap;
wherein more preferably the width adjusting mechanism is configured for rotatably moving the third guiding element between a standby position and the intermediate position;
wherein most preferably the width adjusting mechanism is coupled to one of the first guiding element and the second guiding element for rotatably moving the third guiding element about said one of the first guiding element and the second guiding element between the standby position and the intermediate position.

9. The vehicle according to any one of the preceding claims, wherein the vehicle comprises a brake mechanism configured for controlling a braking force acting on at least one roller configured for rollably supporting the support frame.

10. The vehicle according to any one of the preceding claims, wherein the winding assembly in an operational position is arranged at an acute angle with respect to a horizontal plane for positioning the elongated flexible element in a lateral direction on the winding assembly.

11. The vehicle according to claim 10, wherein the winding assembly is moveably arranged between the operational position for winding the elongated flexible element and a collapsed position, wherein the winding assembly is at least partly accommodated by the support frame.

12. The vehicle according to claim 11, wherein the vehicle comprises a first support yoke mounting the winding assembly onto the support frame, wherein the first support yoke is rotatably coupled by a first connection to the support frame and is rotatably coupled by a second connection to the winding assembly.

13. The vehicle according to claim 11 or 12, wherein the vehicle comprises a second support yoke coupled to the support frame for retaining the winding assembly in the operational position of the winding assembly,
wherein preferably the second support yoke is move-

ably coupled to the support frame for a movement between a support position for retaining the winding assembly in the operational position and a collapsed position with respect to the support frame.

14. The vehicle according to any one of the preceding claims, wherein the vehicle is connected to a user control module configured for controlling the actuator, wherein the user control module is remotely arranged from the vehicle,
wherein preferably the user control module is a handheld module, which is connected to the actuator via a wired connection or via a wireless connection.

15. A method for operating the vehicle according to any one of the preceding claims, the method comprising the steps of:

- Attaching a elongated flexible element, such as a hose, to the winding assembly, which elongated flexible element is laid out on a terrain;
- Controlling the actuator to actuate the winding assembly for winding the elongated flexible element, thereby pulling the vehicle in a forward movement along the elongated flexible element;
- Allowing the vehicle to follow the elongated flexible element while pulling the vehicle along the elongated flexible element.

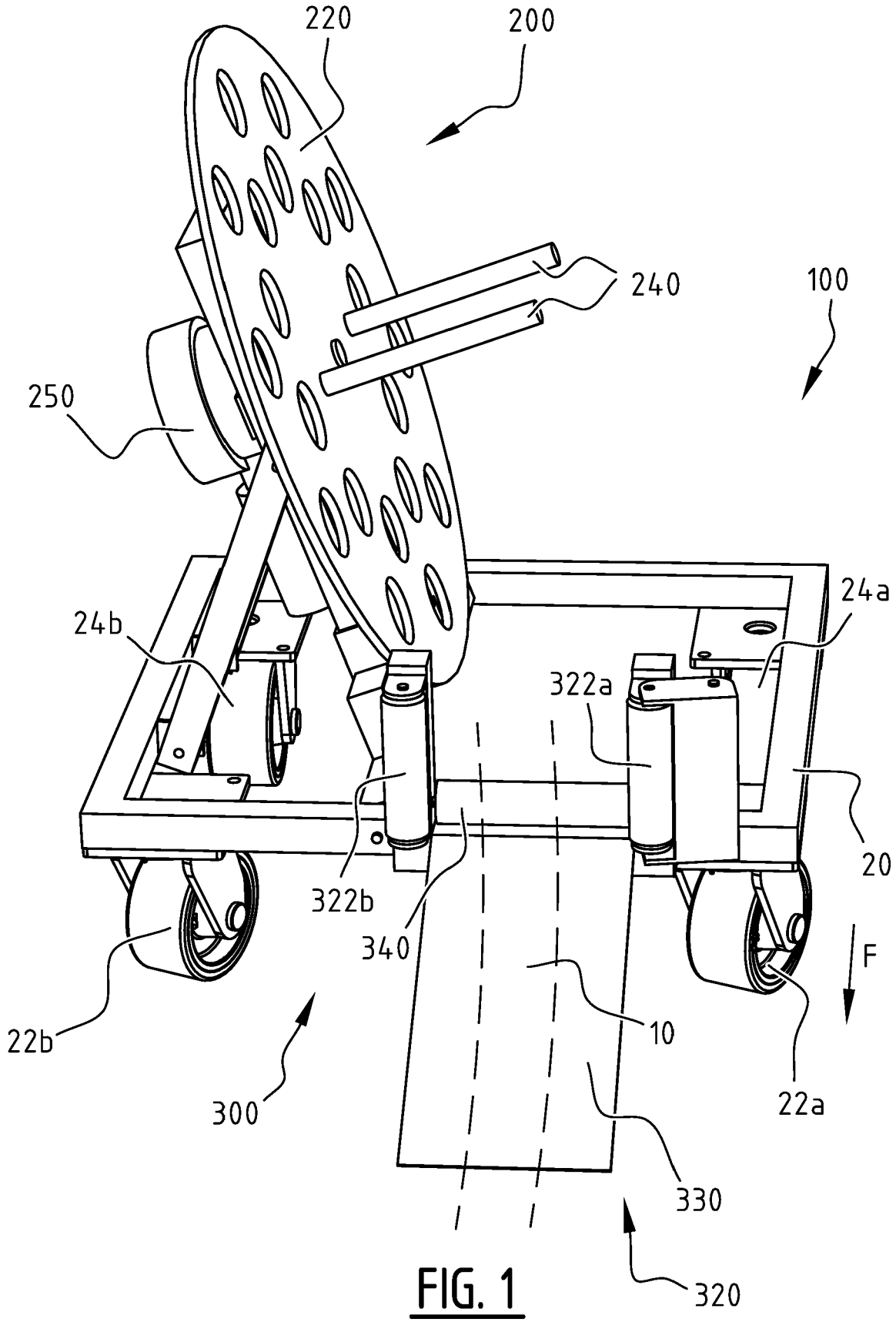
220
200
240
100
250
24a
24b
322a
20
322b
340
F
10
22b
300
22a
330
320

FIG. 1

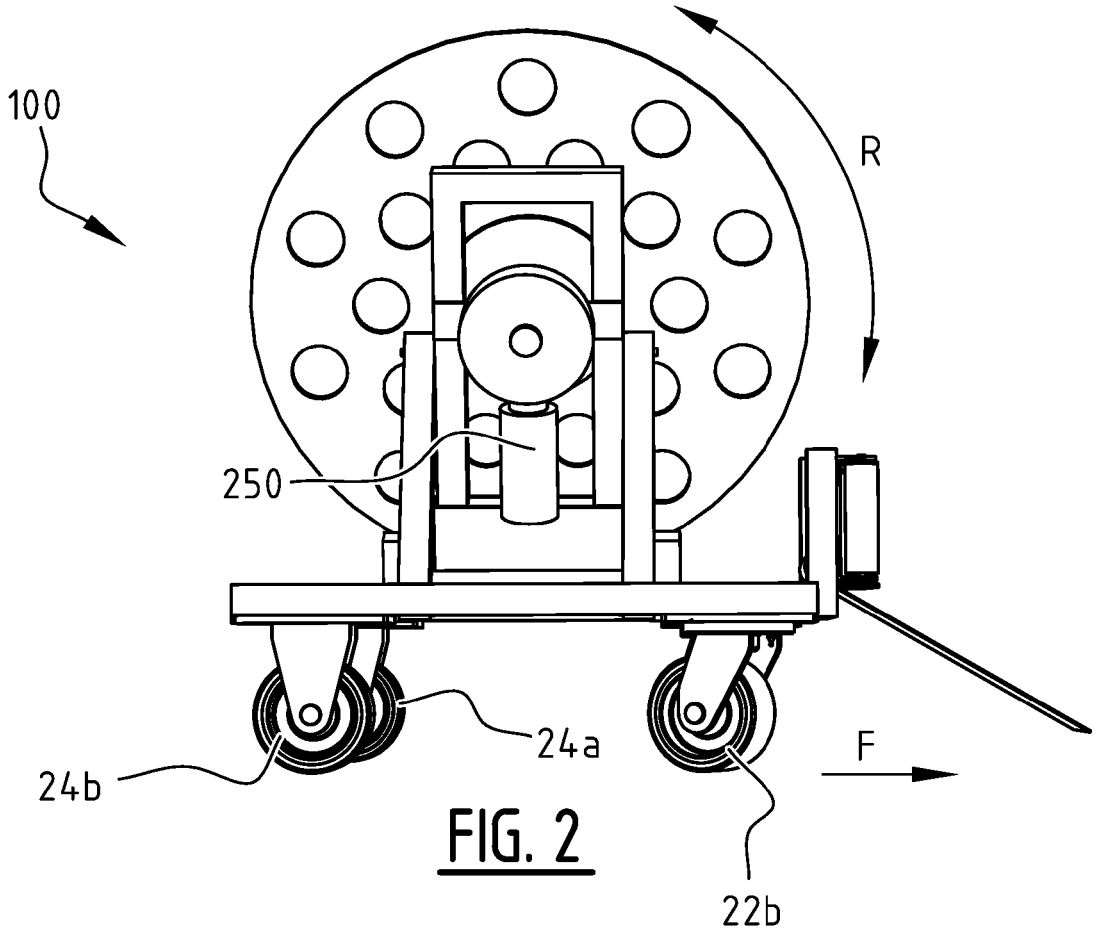

FIG. 2

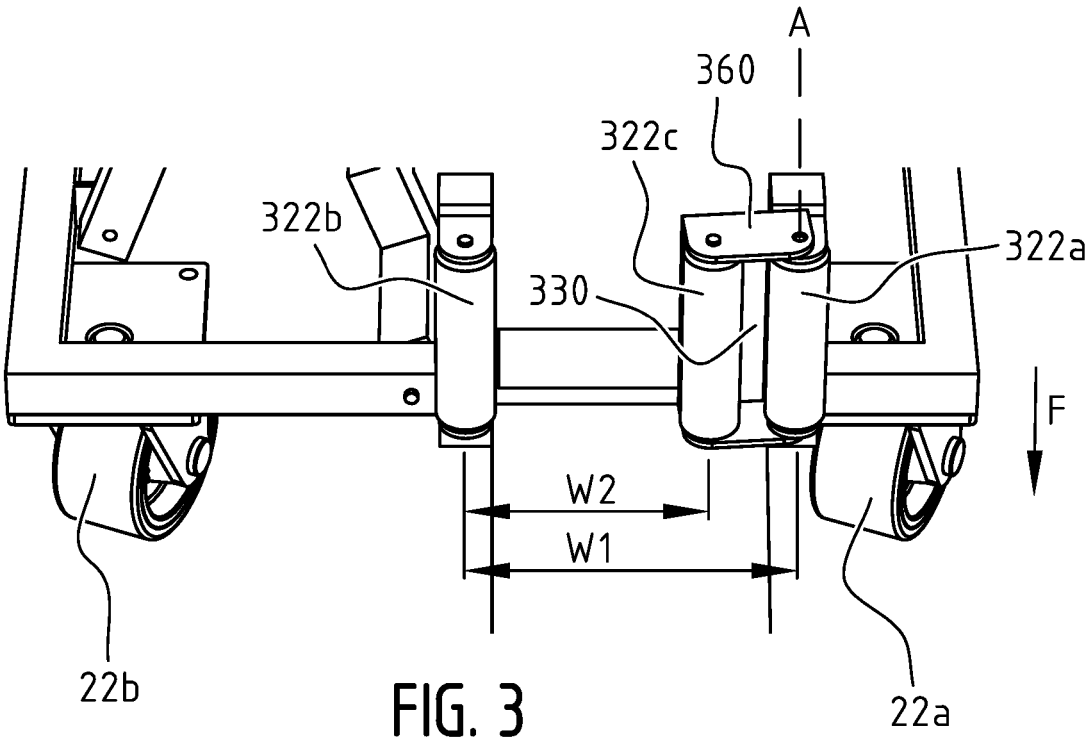

FIG. 3

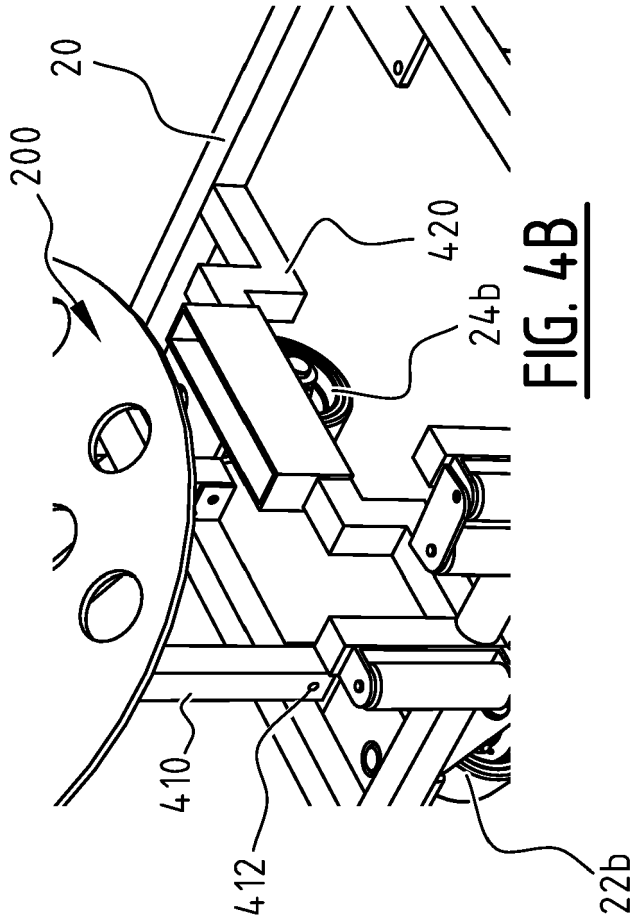

FIG. 4B

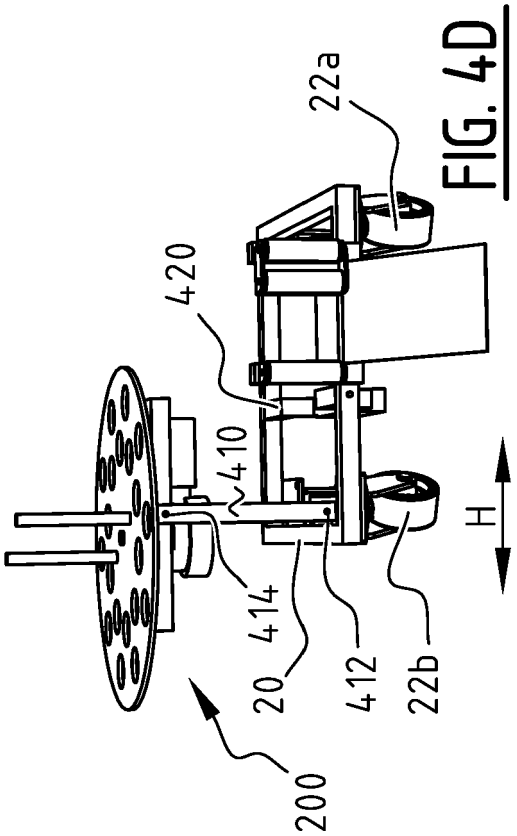

FIG. 4D

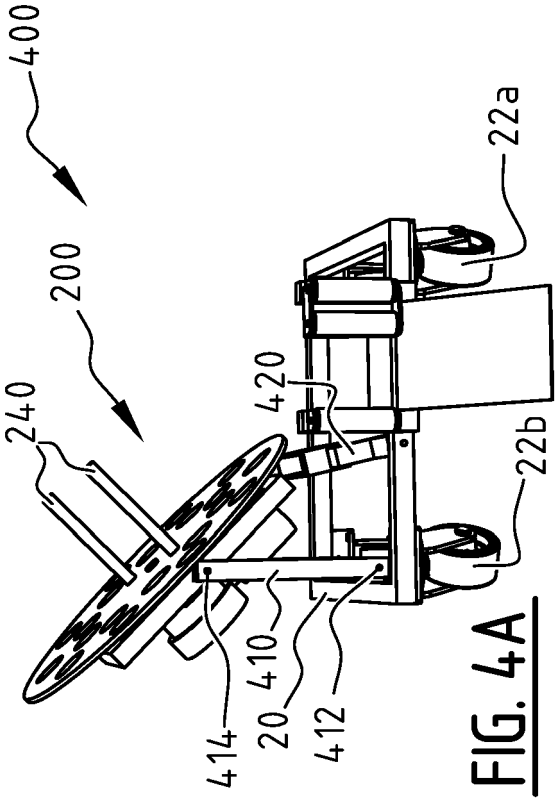

FIG. 4A

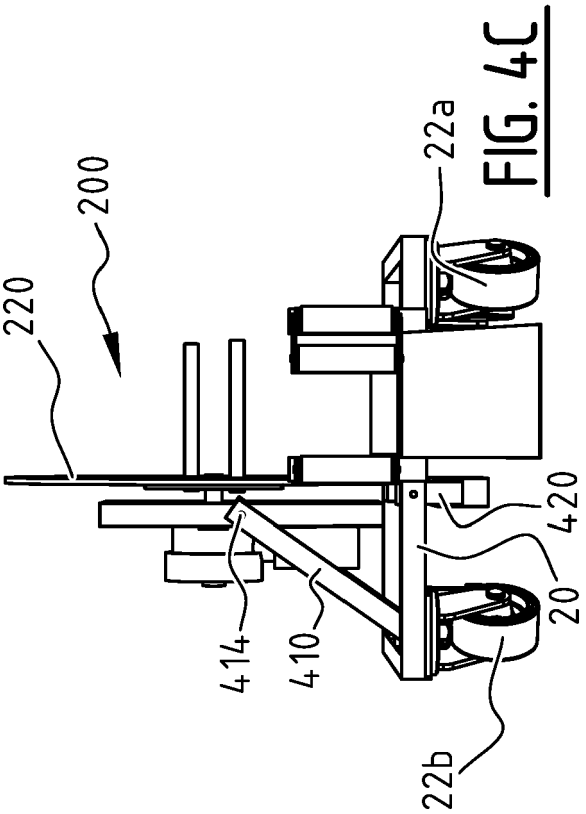

FIG. 4C

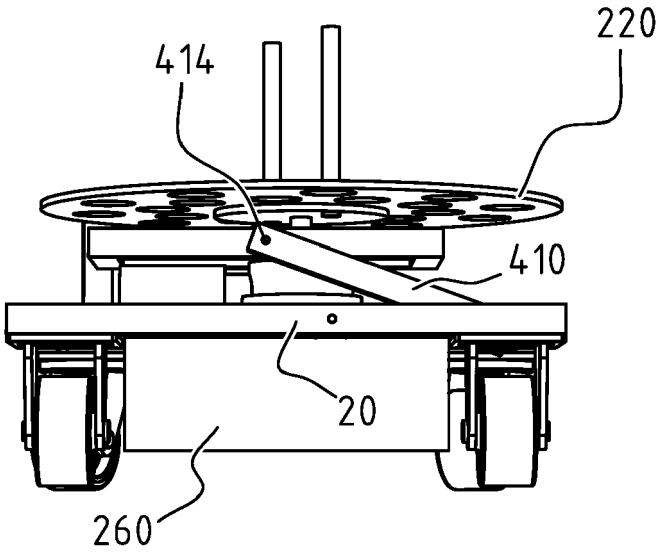

FIG. 4E

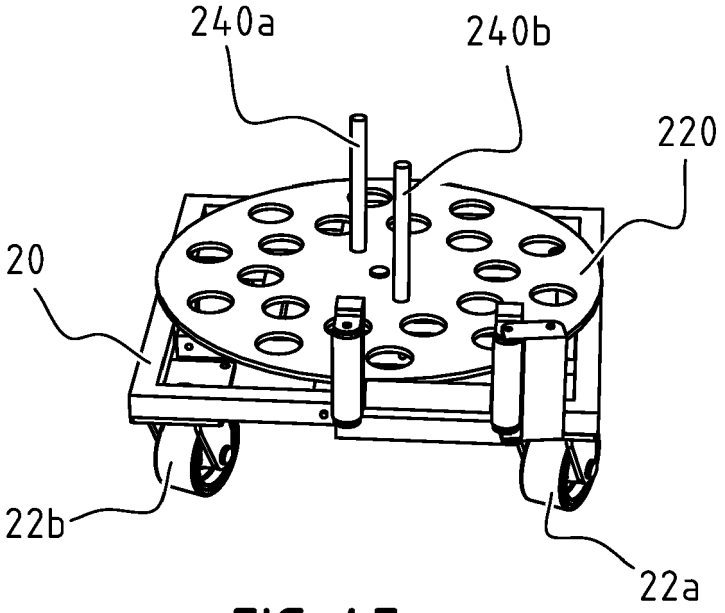

FIG. 4F

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EUROPEAN SEARCH REPORT

Application Number
EP 18 15 2339

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 July 2018	Lemmen, René

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