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(54) **Transport system for transferring persons and method for securing a transport system for transferring persons**

(57) The invention relates to a transport system for transferring persons, comprising:

- a cable bridging a space, the cable extending from a first location to a second location;
- at least one pulley, moveably arranged along the cable
- a first sensor, for detecting passage of the pulley along the first sensor, wherein the first sensor is arranged along the cable between the first location and the second location;
- a second sensor, for detecting passage of the pulley along the second sensor, wherein the second sensor is arranged along the cable between the second location and the first sensor;
- blocking means for blocking passage of further pulleys past the blocking means in the locked position and for releasing passage in the unlocked position, wherein the blocking means are arranged along the cable between the first location and the first sensor; and
- a controller, connected to the first sensor, the second sensor and the blocking means, wherein the blocking means are controlled to the locked position upon detection by the first sensor and are controlled to the unlocked position upon detection by the second sensor.

The invention further relates to a method for securing a transport system for transferring persons.

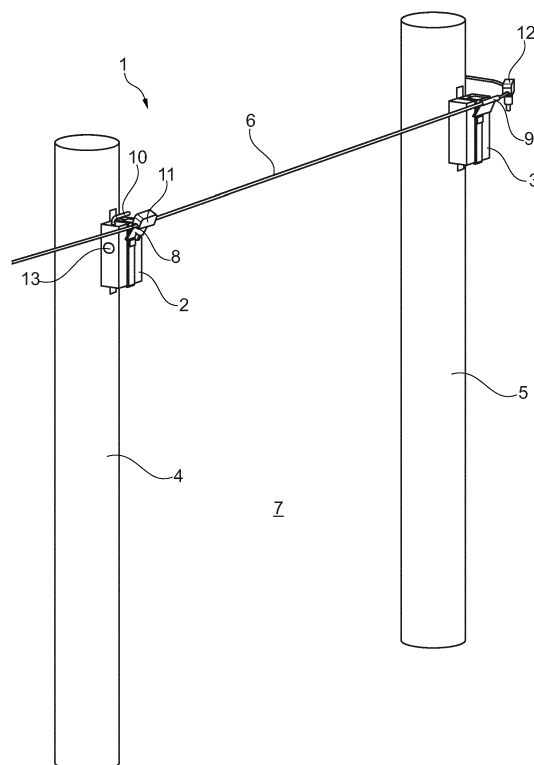


Fig. 1

## Description

**[0001]** The invention relates to a transport system for transferring persons, comprising:

- a cable bridging a space, the cable extending from a first location to a second location; and
- at least one pulley, moveably arranged along the cable.

**[0002]** The invention further relates to a method for securing a transport system for transferring persons.

**[0003]** Persons may be transferred from a first location to a second location for a wide variety of applications. For such applications, which include leisure activities, a cable may be provided to bridge a space, such as for instance a lake or an area of land. The cable may be provided with pulleys, moveable along the cable, and attachable to a person. Such a transport system is typically used in conjunction with more than one pulley, each pulley connected to a person.

**[0004]** When such a transport system is used with more than one pulley, two pulleys may use the cable at the same time and as a consequence, an accident may happen, in which two pulleys may collide. This issue is particularly relevant in relation to transport systems wherein the cable is a zipline. In a zipline system, the persons will travel substantially, or more typically, solely by the force of gravity along the cable between the first location towards the second location, which may cause the pulley to acquire a significant speed.

**[0005]** Some known transport systems, zipline systems in particular, may be provided with braking means. These braking means may be provided on the pulley, and therefore rely on actions to be performed by the user in order to accurately prevent collisions when imminent. This makes the transport system unreliable.

**[0006]** The braking means may also be provided adjacent to the cable and close to the second location in order to decrease the speed of a pulley approaching the second location, but such braking systems do not prevent collisions.

**[0007]** It is therefore the object of the invention to reduce or even obviate the above-mentioned disadvantages of the currently available transport systems.

**[0008]** This object of the invention is achieved by a transport system for transferring persons according to the preamble, which is characterized by

- a first sensor, for detecting passage of the pulley along the first sensor, wherein the first sensor is arranged along the cable between the first location and the second location;
- a second sensor, for detecting passage of the pulley along the second sensor, wherein the second sensor is arranged along the cable between the second location and the first sensor;
- blocking means for blocking passage of further pul-

leys past the blocking means in the locked position and for releasing passage in the unlocked position, wherein the blocking means are arranged along the cable between the first location and the first sensor; and

- a controller, connected to the first sensor, the second sensor and the blocking means, wherein the blocking means are controlled to the locked position upon detection by the first sensor and are controlled to the unlocked position upon detection by the second sensor.

**[0009]** The transport system is equipped with a first sensor and a second sensor, which are both arranged adjacent along a cable of the transport system for detecting passage of a pulley along the cable, both of which sensors are connected to a controller. The second sensor is placed further down the direction of travel of the pulley along the cable.

**[0010]** Blocking means are also arranged along the cable. The blocking means are preferably in the unlocked position in the neutral state for allowing transfer of a pulley beyond the blocking means in the direction of travel of the pulley.

**[0011]** Upon detection of the passage of a pulley by the first sensor, the first sensor will activate the controller and the controller will move the blocking means from the unlocked position to the locked position, in which it blocks transfer of further pulleys. Most preferably, the blocking means are then locked in the locked position. Because the blocking means are arranged along the cable before the first sensor, the pulley currently detected by the first sensor is free to move further down the cable, towards the second sensor.

**[0012]** When the second sensor detects the passage of the trolley, the second sensor will notify the controller, and the controller will move the blocking means back to the unlocked position.

**[0013]** The first sensor and the second sensor as such define a segment of the cable in which only one pulley is able to travel simultaneously. In order to even further prevent the amount of possible collisions, the span of the cable between the first and the second sensor is therefore preferably larger than 50%, more preferably larger than 60%, even more preferably larger than 70% and most preferably larger than 80% of the total span of the cable between the first position and the second position. Preferably, the blocking means are placed before and adjacent to the first sensor, in order to prevent unnecessary delays.

**[0014]** The second sensor is preferably placed close to, e.g. at or beyond, a location in which a person using the pulley passing the second sensor is able to stand.

**[0015]** The cable may also comprise various sets of first and second sensors connected to blocking means, which are connected to each other via at least one controller, each of the sets securing one segment of the cable. The second sensor of a preceding set may than be

the first sensor of the next set.

**[0016]** Preferably, at least an entrance platform is provided below the first position. In such a case, it is further preferred that the first sensor and/or the blocking means are arranged along the cable at a position not reachable by a person present on the platform in order to prevent manipulation of the first sensor and/or blocking means by the person, and thereby unpredictable functioning of the transport system.

**[0017]** The transport system may further comprise a warning system, such as an alarm light, showing the status of the transport system. When the transport system comprises an alarm light, it may be located adjacent to the first position. The alarm light may be in a first color, preferably red, when the blocking means are in the locked position. The alarm light may also be in a distinct second color, preferably green, when the blocking means are in the unlocked position.

**[0018]** The connection of the sensors and the controller may for instance be by e.g. linkage on the same circuit board, by a PLC module, but may also be via a network cable or wireless, e.g. by Bluetooth, infrared communication or wireless networking, as well as other suitable means.

**[0019]** The first sensor, the second sensor or the controller may be connected to a power supply, which may also comprise or be a battery.

**[0020]** The first sensor and the second sensor may detect the passage of the pulley along the sensor by different means, e.g. the sensor may detect metal, which is typically present in the pulley, the sensor may be a detector of movement, the sensor may be a mechanical switch, as well as other types or sensors. The first sensor and/or the second sensor may each also be multiple types of sensors. Preferably, the first sensor and the second sensor have the same detection mechanism.

**[0021]** The blocking means are driven by driving means such as a motor or a cylinder which preferably is provided with a safeguard mechanism, e.g. a sensor to detect abnormal amounts of power required for the movement of the blocking means between the unlocked and the locked position, which is an indication of the possible presence of fingers or other body parts between the blocking means, upon which the controller may automatically return the blocking means to the unlocked position.

**[0022]** The pulley may either be removably arranged on the cable, such that it may be disconnected when reaching the second position. Alternatively, the cable may also be connected to at least one further cable, to which the pulley may be transferred, in which case the pulley is preferably only removable from the cable at the starting point and the end point of all cables connected to each other.

**[0023]** The blocking means, the first sensor and the second sensor are typically mounted on at least one frame, the frame comprising a guiding shank for guiding the cable. The dimensions of the guiding shank are such to allow the pulley to travel over the guiding shank in the

unlocked position of the blocking means and are therefore preferably relatively small.

**[0024]** The pulley may have different designs in order to accommodate the person, e.g. it may be attached to the back of a person, or the user may sit on a seat, fixed to the pulley.

**[0025]** In a preferred embodiment of the transport system according to the invention, the second location is lower than the first location with respect to the direction of gravity and the pulley is moveable from the first location to the second location along the cable substantially by the force of gravity.

**[0026]** The cable extends between a first position and a second position, which are typically above ground level. It is now preferred that the second location is lower than the first location, i.e. closer to ground level, such that the cable as a whole goes down when seen from the first position to the second position, because it allows the pulley to travel along the cable substantially, or preferably solely, by gravity.

**[0027]** In another preferred embodiment of the transport system according to the invention, the blocking means comprise a hingeable arm, wherein the arm extends in the path of the pulley along the cable in the locked position.

**[0028]** In the locked position, the hingeable arm will extend towards the cable such that a pulley arriving at the hingeable arm from the first position will not be able to pass the hingeable arm to travel down the cable. The dimensions of the hingeable arm and the dimensions of the hingeable arm are therefore adjusted to the dimensions of the part of the pulley connected to the cable such that the hingeable arm will extend in the path of the pulley along the cable.

**[0029]** Preferably, the hingeable arm will hinge backward when moving from the unlocked position towards the locked position and vice versa, such to allow the ease of movement to the unlocked position while the hingeable arm blocks a further pulley.

**[0030]** The hingeable arm is preferably controlled by a motor, for instance a 12V-motor, connected to the controller.

**[0031]** In yet another preferred embodiment of the transport system according to the invention, the blocking means comprise a slidable arm, wherein the arm extends in the path of the pulley along the cable in the locked position.

**[0032]** In the locked position, the slidable arm will extend towards the cable such that a pulley arriving at the slidable arm from the first position will not be able to pass the slidable arm to travel down the cable. The dimensions of the slidable arm and the dimensions of the slideable arm are therefore adjusted to the dimensions of the part of the pulley connected to the cable such that the slideable arm will extend in the path of the pulley along the cable.

**[0033]** Preferably, the slideable arm is enclosed in a shank for properly defining the position of the slideable

arm. The shank may be provided with indicia to define the unlocked and locked position of the slideable arm, such to allow the ease of movement between the unlocked position and the locked position.

**[0034]** The slideable arm is preferably controlled by a cylinder, connected to the controller.

**[0035]** In again another preferred embodiment of the transport system according to the invention, the first sensor and the blocking means are fixed to one housing.

**[0036]** Because the blocking means are preferably placed adjacent to the first sensor, it is preferred to fix the first sensor and the blocking means to one housing, since it reduces the number of parts necessary to be installed along the cable. The controller may also be fixed into the same housing.

**[0037]** In another preferred embodiment of the transport system according to the invention, the cable is a zipline.

**[0038]** A zipline transport system is a system commonly used for transporting persons, typically used for leisure purposes, in which persons travel along the cable substantially or solely by the force of gravity, and for which it is desirable to be able to enhance the security of the persons. Because of this need, and because the transport system provides such an enhancement, the cable of the transport system is preferably a zipline.

**[0039]** The object of the invention is further achieved with a method for securing a transport system for transferring persons, comprising the steps of:

- detecting the passage of a pulley by a first sensor of a transport system arranged along a cable from a first location to a second location;
- transmitting a detection signal by the first sensor to the controller after detecting the passage;
- moving the blocking means by the controller to a locked position after receiving the detection signal from the first sensor;
- detecting the passage of the pulley by a second sensor of the transport system arranged along the cable after the detection of the passage of the pulley by the first sensor;
- transmitting a detection signal by the second sensor to the controller after the detection of the passage of the pulley by the second sensor;
- moving the blocking means by the controller to an unlocked position after receiving the detection signal from the second sensor.

**[0040]** The process of securing a transport system according to the invention according to the above mentioned method increases the security of the transport system, since the use of the method lets the first sensor and the second sensor as such define a segment of the cable in which only one pulley is able to travel simultaneously.

**[0041]** The method is preferably endlessly repeated.

**[0042]** These and other features of the invention will be elucidated in conjunction with the accompanying fig-

ures.

Figure 1 shows in perspective a part of a first embodiment of a transport system according to the invention with the locking means in the unlocked position.

Figure 2 shows a detail of the embodiment according to figure 1 with the locking means in the locked position.

Figure 3 shows a detail of a second embodiment of a transport system according to the invention with locking means in the unlocked position.

Figure 4 shows an overview of an embodiment of a transport system according to the invention.

**[0043]** In Figure 1, a part of a transport system 1 is shown in which two housings 2, 3 are attached to poles 4, 5. A cable 6 bridges the space 7 between the poles 4, 5 and declines in the direction of pole 5. The cable 6 is attached via shafts 8, 9 attached to housings 2, 3. The first housing 2 comprises a bar 10, moveable in direction A (shown in Figure 2), attached to a motor (not shown) in the housing 2. In this Figure, the bar 10 is shown in unlocked position. The housings 2, 3 each comprise a sensor (not shown) for the detection of the passage of pulleys 11, 12 along the, of which pulleys 11, 12 only the top part is shown.

**[0044]** Since the cable 6 declines from pole 4 towards pole 5, the pulleys 11, 12 will travel towards in the same direction by the force of gravity. Upon detection of pulley 11 by the sensor in the first housing 2, the pulley 11 will be allowed to pass the housing and when possible, the bar 10 will move towards the locked position as shown in Figure 2. After the bar 10 has been moved to the locked position, possible further pulleys approaching the first housing 2 will be blocked by bar 10. This may also be reflected in the status of a warning light 13, arranged on the housing 2.

**[0045]** Upon detection of the pulley 11 by the sensor in the second housing 3, a signal will be sent from the second housing 3 towards the first housing 2 and the bar will be moved to the unlocked position, such that possible further pulleys may enter the segment 6 of the cable.

**[0046]** Figure 2 shows a detail of the first housing 2, in which the bar 10 is moved in direction A to the locked position. The shaft 8 is attached with a brace 14 to the housing 2. The pulley 11 is selected such that it able to travel over the shaft 8 when the bar 10 is in the unlocked position.

**[0047]** In an alternate embodiment as shown in figure 3, a brace 20 is shown, attached to a pole 21. The brace 20 is connected to a shaft 22 around the cable 23. A pulley 24 is able to travel over cable 23 and shaft 22 in the unlocked position as shown. The brace 20 comprises a bar 25, slidable in direction B within shaft 26, towards the cable 23 by suitable driving means, such as a cylinder (not shown). In the locked position, bar 25 will cross the path of pulley 24, such that it will not be able to pass

beyond bar 25.

**[0048]** Figure 4 shows an overview of a transport system 30, comprising poles 31, 32, 33, 34 and a cable 35 bridging the spaces 36, 37, 38 between the poles 31, 32, 33, 34. The cable 35 is attached with its first end at a first point 39 on pole 31 and with its second end at a second point 40 on pole 34. The cable 35 also connected to poles 32, 33 through shafts (not shown), which shafts are attached to housings 41, 42. The cable 35 is thus divided in segments 43, 44, 45. A first pulley 46 is has entered the main segment 44. Because the first pulley has passes the first housing 41, the blocking means (not shown) on first housing 41 will be in the locked position, such that a further pulley 47 will not be able to pass the blocking means. After passage of the first pulley 46 along the sensor in the second housing 42, the blocking means of the first housing will be moved to the unlocked position and pulley 47 will be able to enter the segment 44.

**[0049]** In comparison to the total length of the cable 35, segment 44 has a significantly greater length than segments 43, 45. First housing 41 is arranged adjacent to an entrance platform 48, however out of reach of a person standing on platform 48. Second housing 42 is arranged adjacent to an exit platform 49.

**[0050]** In this embodiment, status indicators 50, 51 are arranged in a separate housing 52, indicating if the blocking means are in the locked position or in the unlocked position.

## Claims

1. Transport system for transferring persons, comprising:

- a cable bridging a space, the cable extending from a first location to a second location; and
- at least one pulley, moveably arranged along the cable

### characterized by

- a first sensor, for detecting passage of the pulley along the first sensor, wherein the first sensor is arranged along the cable between the first location and the second location;
- a second sensor, for detecting passage of the pulley along the second sensor, wherein the second sensor is arranged along the cable between the second location and the first sensor;
- blocking means for blocking passage of further pulleys past the blocking means in the locked position and for releasing passage in the unlocked position, wherein the blocking means are arranged along the cable between the first location and the first sensor; and
- a controller, connected to the first sensor, the second sensor and the blocking means, wherein the blocking means are controlled to the locked position upon detection by the first sensor and

are controlled to the unlocked position upon detection by the second sensor.

2. Transport system according to claim 1, wherein the second location is lower than the first location with respect to the direction of gravity and wherein the pulley is moveable from the first location to the second location along the cable substantially by the force of gravity.
3. Transport system according to claim 1 or 2, wherein the blocking means comprise a hingeable arm, wherein the arm extends in the path of the pulley along the cable in the locked position.
4. Transport system according to claim 1, 2 or 3, wherein the blocking means comprise a slidable arm, wherein the arm extends in the path of the pulley along the cable in the locked position.
5. Transport system according to any of the preceding claims, wherein the first sensor and the blocking means are fixed to one housing.
6. Transport system according to any of the preceding claims, wherein the cable is a zipline.
7. Method for securing a transport system for transferring persons, comprising the steps of:

- detecting the passage of a pulley by a first sensor of a transport system arranged along a cable from a first location to a second location;
- transmitting a detection signal by the first sensor to the controller after detecting the passage;
- moving the blocking means by the controller to a locked position after receiving the detection signal from the first sensor;
- detecting the passage of the pulley by a second sensor of the transport system arranged along the cable after the detection of the passage of the pulley by the first sensor;
- transmitting a detection signal by the second sensor to the controller after the detection of the passage of the pulley by the second sensor;
- moving the blocking means by the controller to an unlocked position after receiving the detection signal from the second sensor.

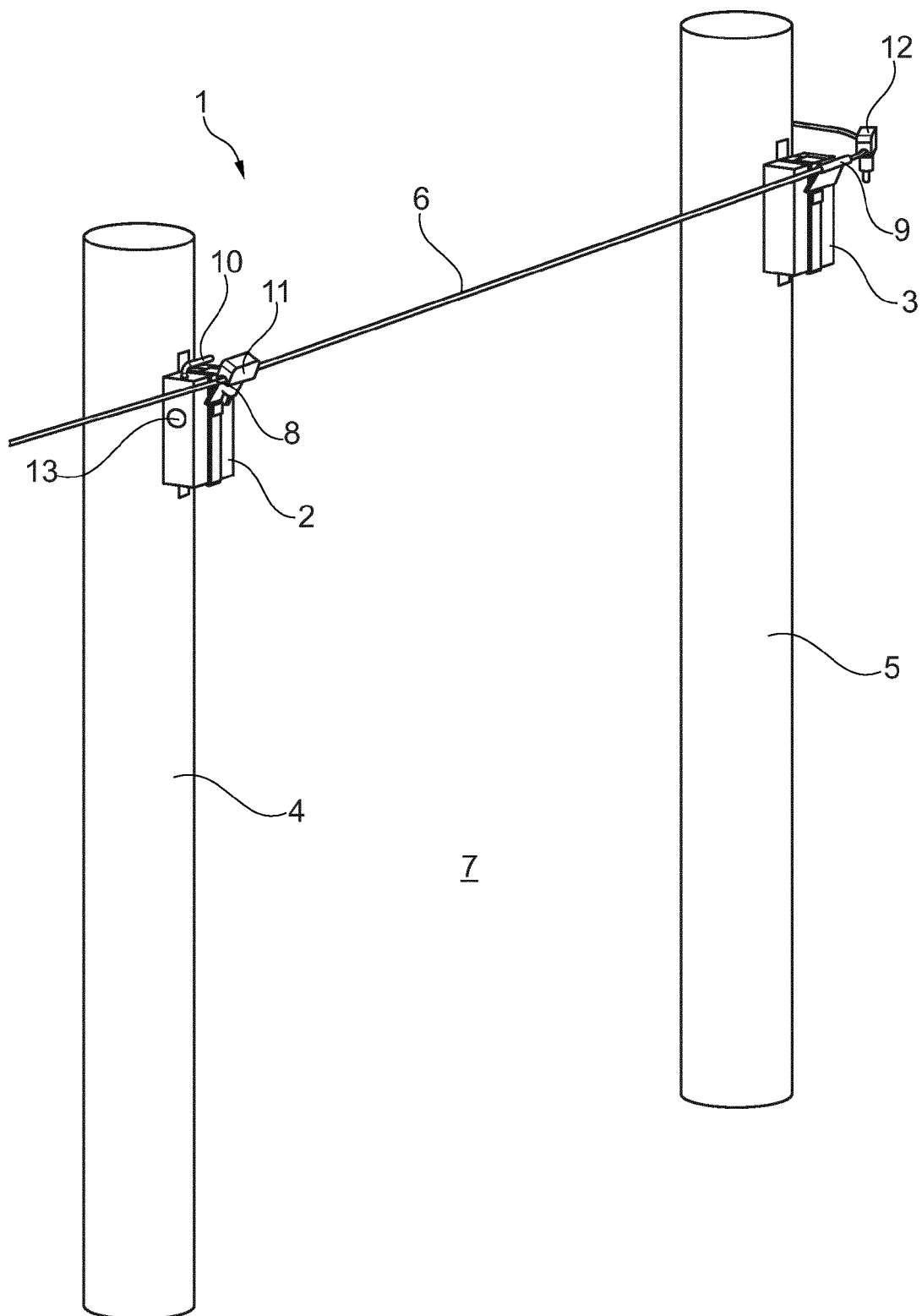


Fig. 1

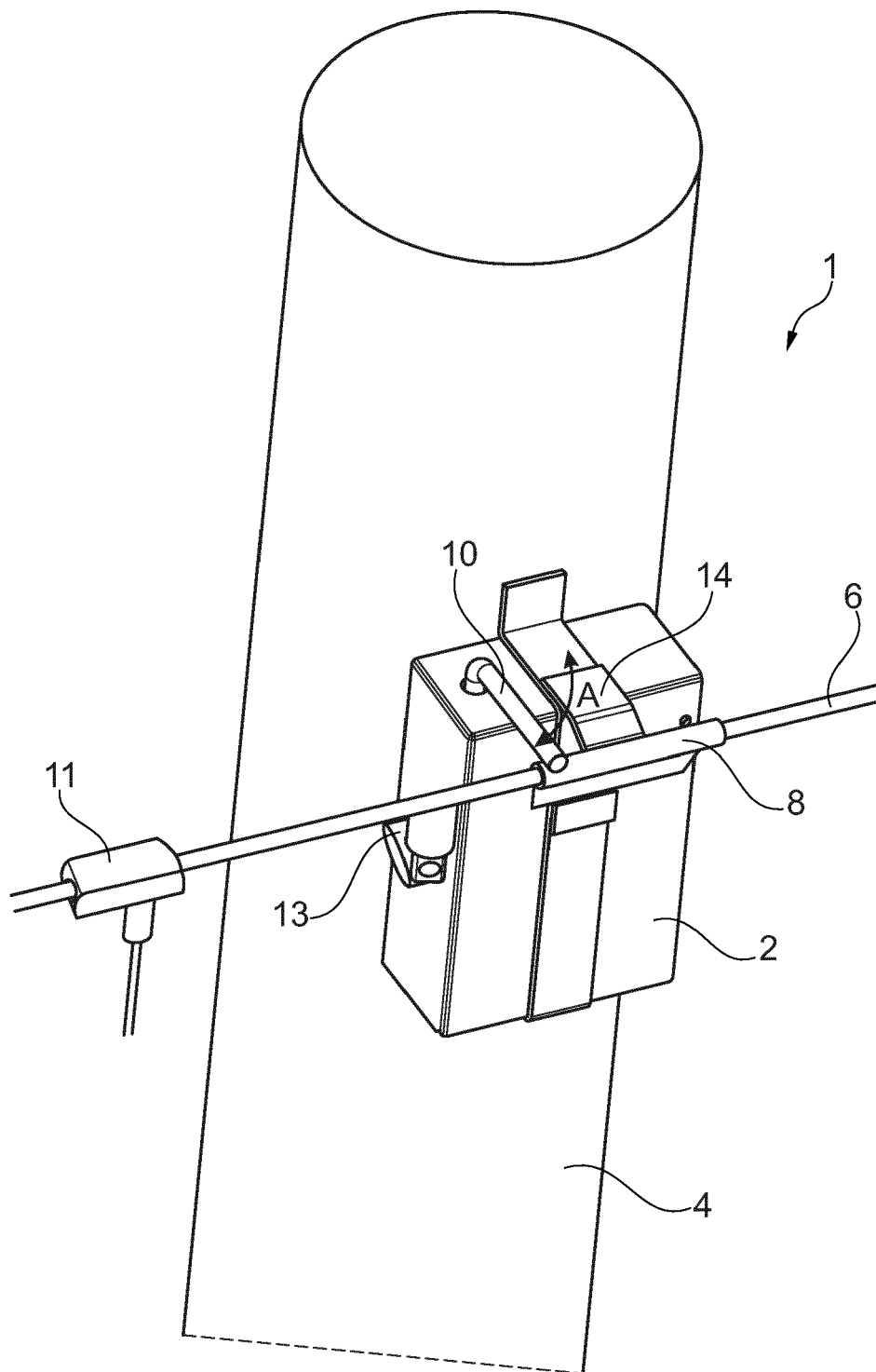


Fig. 2

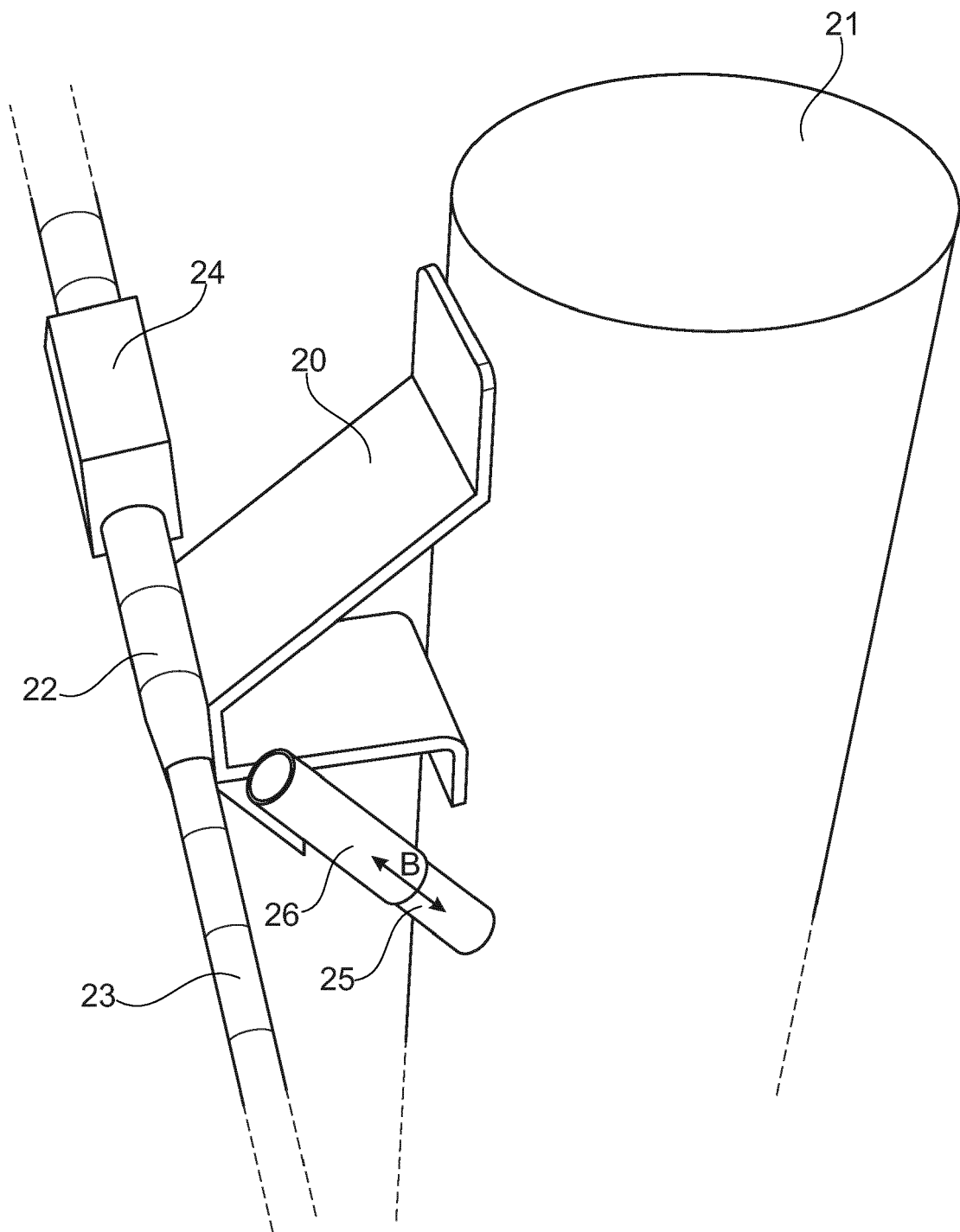


Fig. 3

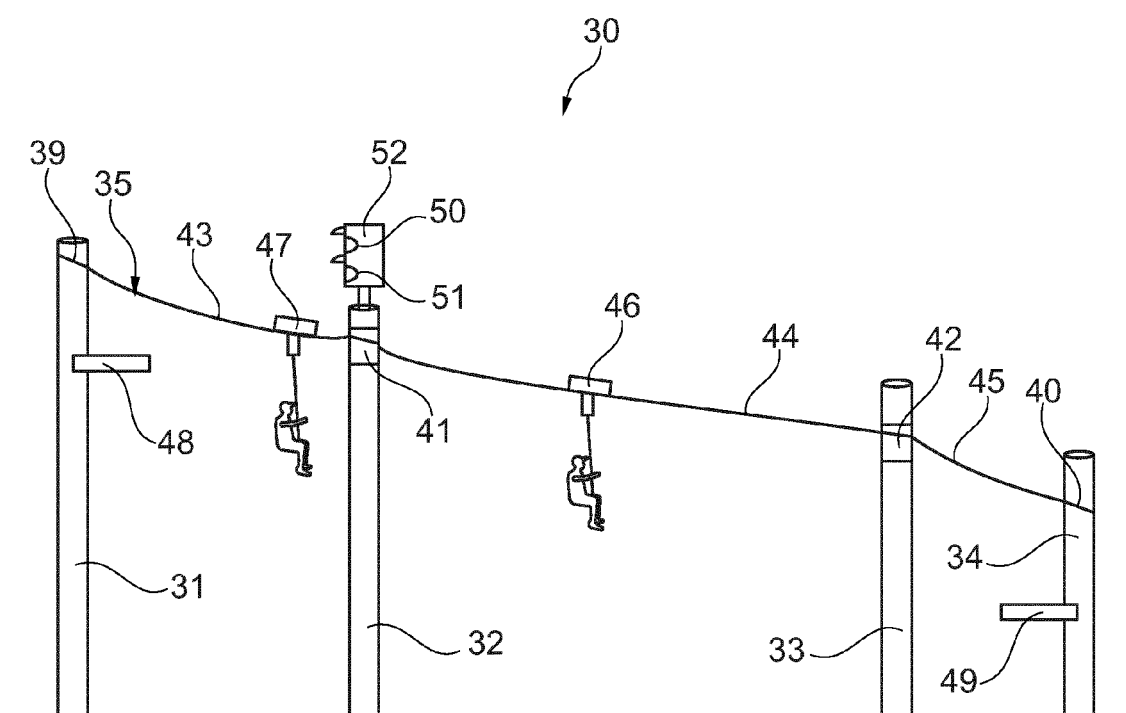


Fig. 4



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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                       |                                                          |                                                         |
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