

DEVICE AND METHOD FOR INSTALLING CABLE, AND MOVING CART

TECHNICAL FIELD

5 [0001] The present invention relates to a moving cart for a cable installation device, and a cable installation device and method.

BACKGROUND ART

10 [0002] In general, a cable is installed by installing a power conduit underground in the form of a tunnel and inserting and moving the cable inside the power conduit.

[0003] Conventionally, in order to move the cable inside the power conduit, a method of installing a plurality of caterpillars in the power conduit and pulling the cable using the caterpillars is employed. This method using the caterpillars is applicable to a short-distance cable which is relatively short. However, in the case of a long-distance cable which is greater than or equal to a predetermined length, a plurality of caterpillars should be installed and thus it is difficult to synchronize the caterpillars with one another due to a decrease in driving power caused by a voltage drop. Accordingly, a tensile force may be applied to the cable by the caterpillars pulling the cable by different driving powers and thus the cable may be broken or damaged.

20 [0004] Furthermore, in the method using the caterpillars to pull the cable, the cable is grasped and pulled by installing the caterpillars at opposite sides of the cable and thus an external force is applied to the cable. In order to install a cable which is long and heavy at a time, an external force applied to grasp the cable should be increased and thus an insulating layer of the cable may be deformed by the external force. In particular, in the case of a paper insulating cable having an insulating layer formed of insulating paper impregnated with insulating oil, the insulating layer is likely to be deformed to a larger extent.

[0005] Alternatively, a method of moving the cable inside the power conduit using a tow truck such as a battery car is used. However, in the case of a long-distance cable, the cable should be moved by installing a plurality of tow trucks. In this case, the speeds of the tow trucks are difficult to be maintained constant and a tensile force may be applied to the cable, thereby causing the cable to be broken or damaged.

[0006] FIG. 12 is a cross-sectional view of a power conduit in which a cable is installed. A cable is installed by installing a guide support at a left side and/or a right side of the power conduit and forming a hanger on the guide support to place/fix the cable on the hanger. However, when the cable is installed in the power conduit using the caterpillars or the battery car, the cable is moved by installing the caterpillars or the battery car at a center of the power conduit. Thus, the moved cable should be additionally moved directly by a worker or using an additional device to place the moved cable on the hanger, i.e., to move the cable moved along the center of the power conduit in a left or right direction.

DETAILED DESCRIPTION OF THE INVENTION

TECHNICAL PROBLEM

[0007] To solve the above problem, the present invention is directed to a moving cart for a cable installation device and a cable installation device and method, which are capable of preventing a cable from being damaged or broken when the cable is a long-distance cable which is relatively long and is installed by moving it inside a power conduit.

TECHNICAL SOLUTION

[0008] According to an aspect of the present invention, a cable installation device comprises: a guide rail included in a power conduit; a moving cart fastened with the guide rail to be moved

along the guide rail; a sling belt coupled to the moving cart to support a cable, and configured to be moved together with the moving cart; and a driving part configured to move the moving cart along the guide rail.

5 [0009] According to an another aspect of the present invention, the driving part transfers the cable by pulling out either the sling belt or a connection wire connected to the cable to guide the moving cart to be moved along the guide rail.

10 [0010] According to an another aspect of the present invention, the driving part transfers the cable by pulling out either the sling belt or a connection wire connected to the cable to guide the moving cart to be moved along the guide rail.

15 [0011] According to an another aspect of the present invention, the driving part comprises: a winch configured to apply driving power to pull out the connection wire; and a winding part configured to wind the pulled-out connection wire.

20 [0012] According to an another aspect of the present invention, the guide rail comprises an I-beam or an H-beam including an upper flange, a lower flange, and a wave connecting the upper and lower flanges.

25 [0013] According to an another aspect of the present invention, the cable installation device comprises: a guide-rail fixing bracket configured to fix the upper flange; a guide-rail support bracket coupled to a guide support arranged in the power conduit; and a connection adjustment part arranged between the guide-rail fixing bracket and the guide-rail support bracket, and configured to adjust a distance between the guide-rail fixing bracket and the guide-rail support bracket.

30 [0014] According to an another aspect of the present invention, the connection adjustment part comprises a screw thread on an outer circumference surface thereof to be meshed with the guide-rail support bracket, and the distance between the guide-rail fixing bracket and the guide-rail support bracket is adjusted by rotating the connection adjustment part.

[0015] According to an another aspect of the present invention, the moving cart comprises: a body part supported by coupling the sling belt thereto below the lower flange; a main roller coupled to the body part to be rotatable on the lower flange; first auxiliary rollers coupled to the body part to be rotated in contact with a side surface of the lower flange; and second auxiliary rollers coupled to the body part to be rotated in contact with a lower surface of the lower flange, wherein when the connection wire is pulled out by the driving part, the main roller is rotated on the lower flange to move the moving cart along the guide rail.

[0016] According to an another aspect of the present invention, the first auxiliary rollers are arranged to correspond to opposite side surfaces of the lower flange, and prevent the moving cart from deviating to a left or right side of the guide rail when the moving cart is moved along the guide rail.

[0017] According to an another aspect of the present invention, the second auxiliary rollers are arranged between the lower surface of the lower flange and the body part, and configured to prevent the body part from being raised and bumped against the lower flange.

[0018] According to an another aspect of the present invention, A moving cart for use in a cable installation device which installs a cable by moving the cable along a guide rail installed in a power conduit comprises: a body part supported by coupling a sling belt which supports the cable thereto below a lower flange of the guide rail; a main roller coupled to the body part to be rotatable on the lower flange; first auxiliary rollers coupled to the body part to be rotatable in contact with a side surface of the lower flange; and second auxiliary rollers coupled to the body part to be rotatable in contact with a lower surface of the lower flange, wherein the main roller is rotated on the lower flange to move the moving cart along the guide rail.

[0019] According to an another aspect of the present invention, the first auxiliary rollers are arranged to correspond to opposite side surfaces of the lower flange, and prevent the moving cart

from deviating to a left or right side of the guide rail when the moving cart is moved along the guide rail.

[0020] According to an another aspect of the present invention, the second auxiliary rollers are arranged between the lower surface of the lower flange and the body part, and prevent the body part from being raised and bumped against the lower flange.

[0021] According to an another aspect of the present invention, a method of installing a cable in a power conduit using a cable installation device comprises: installing the cable installation device in the power conduit; and transferring a cable using the cable installation device, wherein the cable installation device comprises: a moving cart configured to be moved inside the power conduit to transfer the cable; and a driving part configured to move the moving cart.

[0022] According to an another aspect of the present invention, the installing of the cable installation device comprises: installing a rail fixing part at a guide support formed at a side of the power conduit; installing a guide rail on the rail fixing part; and installing a moving cart to be movable along the guide rail, the moving cart configured to move the cable.

[0023] According to an another aspect of the present invention, the cable installation device further comprises a support belt coupled to the moving cart to support the cable and configured to be moved together with the moving cart, and the transferring of the cable comprises: supporting the cable by placing the cable on the support belt; and transferring the cable by pulling out a connection wire connected to the cable by the driving part to move the moving cart along the guide rail.

[0024] According to an another aspect of the present invention, the driving part comprises: a winch configured to provide driving power to pull out the connection wire; and a winding part configured to wind the connection wire, and the transferring of the cable comprises transferring the cable by pulling out the connection wire using only a turning force applied by the winch and winding

the connection wire around the winding part by controlling a speed of rotation of the winding part.

[0025] According to an another aspect of the present invention, the guide rail comprises an I-beam or an I-beam including an upper flange, a lower flange, and a wave connecting the upper flange and the lower flange.

[0026] According to an another aspect of the present invention, the rail fixing part comprises: a guide-rail fixing bracket configured to fix the upper flange; a guide-rail support bracket coupled to a guide support arranged in the power conduit; and a connection adjustment part arranged between the guide-rail fixing bracket and the guide-rail support bracket, and configured to adjust a distance between the guide-rail fixing bracket and the guide-rail support bracket, and the installing of the cable installation device further comprises adjusting the distance between the guide-rail fixing bracket and the guide-rail support bracket using the connection adjustment part.

[0027] According to an another aspect of the present invention, the connection adjustment part comprises a screw thread on an outer circumference surface to be meshed with the guide-rail support bracket, and the distance between the guide-rail fixing bracket and the guide-rail support bracket is adjusted by rotating the connection adjustment part.

[0028] According to an another aspect of the present invention, the moving cart comprises: a body part being supported by coupling the sling belt thereto below the lower flange; a main roller coupled to the body part to be rotatable on the lower flange; first auxiliary rollers coupled to the body part to be rotated in contact with a side surface of the lower flange; and second auxiliary rollers coupled to the body part to be rotated in contact with a lower surface of the lower flange, and when the connection wire is pulled by the driving part, the main roller is rotated on the lower flange to move the moving cart along the guide rail.

[0029] According to an another aspect of the present invention, the first auxiliary rollers are arranged to correspond to opposite side surfaces of the lower flange, and prevent the moving cart from deviating to a left or right side of the guide rail when the moving cart is moved along the guide rail.

[0030] According to an another aspect of the present invention, the second auxiliary rollers are arranged between a lower surface of the lower flange and the body part to prevent the body part from being raised and bumped against the lower flange.

[0031] According to an another aspect of the present invention, the supporting of the cable comprises monitoring a moving distance of the moving cart and placing the cable on the support belt.

[0032] According to an another aspect of the present invention, the guide support comprises at least one hanger configured to place the transferred cable thereon, the guide rail is formed on the guide support to be spaced a certain distance apart from the hanger in a direction roughly perpendicular to the hanger, and the cable transferred by moving the moving cart along the guide rail is separated from the support belt and placed on the hanger.

ADVANTAGEOUS EFFECTS

[0033] According to the present invention as described above, when a long-distance cable which is relatively long is moved and installed inside a power conduit, the cable can be prevented from being damaged or broken.

DESCRIPTION OF THE DRAWINGS

[0034] FIG. 1 is a diagram schematically illustrating a state in which a cable installation device is provided in a power conduit, according to the present invention.

[0035] FIGS. 2 and 3 are perspective views of a cable installation device according to the present invention.

[0036] FIG. 4 is a perspective view of a guide-rail fixing bracket for fixing a guide rail and a guide-rail support bracket fixed

on a guide support.

[0037] FIG. 5 is a diagram illustrating adjustment of a height of a guide-rail fixing bracket.

[0038] FIG. 6 is a perspective view illustrating a state in which a moving cart is fastened with a guide rail.

[0039] FIG. 7 is a rear perspective view of a moving cart.

[0040] FIG. 8 is a side view of a moving cart.

[0041] FIG. 9 is a plan view of a moving cart.

[0042] FIG. 10 is a photograph of a moving-cart monitoring part.

[0043] FIG. 11 is a photograph of a tensile-force monitoring device.

MODE OF THE INVENTION

[0044] Hereinafter, various embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0045] FIG. 1 is a diagram schematically illustrating a state in which a cable installation device 1000 is provided in a power conduit 100, according to the present invention.

[0046] Referring to FIG. 1, the cable installation device 1000 according to an embodiment of the present invention includes a guide rail 200 included in the power conduit 100, a plurality of moving carts 300 provided to be movable along the guide rail 200 and configured to support and move a cable 10, and a driving part 500 configured to move the moving carts 300 along the guide rail 200.

[0047] The power conduit 100 has a size which can be moved by a worker, is buried underground, and is connected to an object such as a building 20 in which the cable 10 is installed.

[0048] The cable installation device 1000 according to the present invention is provided in the power conduit 100. First, a guide support 400 is installed in the power conduit 100. A plurality of guide supports 400 may be installed along the inside of the power conduit 100 or may be installed at a side or opposite

sides of the power conduit 100.

[0049] FIG. 2 is a perspective view of a cable installation device according to the present invention. FIG. 3 is a perspective view illustrating a guide rail, a moving cart, a guide-rail fixing bracket, and a guide-rail support bracket.

[0050] Referring to FIGS. 2 and 3, the guide support 400 may be formed at a side of the power conduit 100 to be perpendicular to the ground. At least one hanger 410 may extend by a certain length from the guide support 400.

[0051] At least one hanger 410 is provided on the guide support 400 and is formed such that the cable 10 moved along the inside of the power conduit 100 is placed thereon. The hanger 410 may extend by the certain length from the guide support 400.

[0052] The cable installation device 1000 according to an embodiment of the present invention includes the guide rail 200 provided in the power conduit 100, and the driving part 500 configured to move the moving cart 300 without using the moving cart 300 as a so-called 'tow truck' moved by driving power generated by itself, when a sling belt 700 having the cable 10 placed thereon is moved along the guide rail 200 together with the moving cart 300.

[0053] The driving part 500 may transfer the cable 10 by pulling out either the sling belt 700 or a connection wire 20 connected to the cable 10 to move the moving cart 300 along the guide rail 200. The driving part 500 may be arranged at a location at which installation of the cable 10 is completed or an intermediate location. Thus, the cable 10 is moved along the guide rail 200 by pulling out the connection wire 20 connected to the cable 10.

[0054] The driving part 500 may include, for example, a winch 510 and a winding part 520 as illustrated in FIG. 1.

[0055] The winch 510 provides driving power for pulling out, i.e., drawing the connection wire 20. The winch 510 may include a motor 511 for providing a turning force, and a pulley 512 rotated by the turning force applied by the motor 511. The connection wire

20 is pulled out when the pulley 512 is rotated in a state in which the connection wire 20 is wound around the pulley 512.

[0056] The pulled-out connection wire 20 is wound by the winding part 520. The winding part 520 is additionally provided to wind the connection wire 20 without winding the connection wire 20 directly by the winch 510, since as a number of turns of the connection wire 20 increases, a whole diameter of the wound connection wire 20 increases and the speed of winding the connection wire 20 changes. Thus, in order to transfer the cable 10 at a constant speed, the winch 510 pulls out the connection wire 20 only using a turning force and the pulled-out connection wire 20 is wound by the winding part 520.

[0057] The winding part 520 may include a reel 522 around which the connection wire 20 is wound, and a reel motor part 521 which rotates the reel 522. The connection wire 20 which is pulled out by the winch 510 is wound around the reel 522 rotated by the reel motor part 521. The more the connection wire 20 wound around the reel 522, the greater the whole diameter of the connection wire 20 wound around the reel 522. Thus, the reel motor part 521 may control the speed of rotation of the reel 522 so that the connection wire 20 may be wound around the reel 522 at a constant speed.

[0058] The guide rail 200 may include a so-called I-beam or H-beam fixed on a guide-rail fixing bracket 620.

[0059] The guide rail 200 may include a lower flange 210, an upper flange 220 opposite the lower flange 210, and a wave 230 connecting the lower flange 210 and the upper flange 220.

[0060] FIG. 4 is a perspective view of a guide-rail fixing part 600 for fixing a guide rail 200. The guide-rail fixing part 600 may include the guide-rail fixing bracket 620 and a guide-rail support bracket 610. The guide-rail fixing part 600 may be spaced a certain distance apart from the hanger 410 in a direction roughly perpendicular to the hanger 410, and be preferably formed on the guide support 400 to be spaced the certain distance apart from the hanger 410 in the direction roughly perpendicular to the hanger

410.

[0061] Referring to FIG. 4, the guide-rail fixing bracket 620 fixes the guide rail 200 while covering opposite side parts of the upper flange 220 of the guide rail 200. The guide-rail support bracket 610 is fixed by coupling one end thereof to the guide support 400 installed in the power conduit 100.

[0062] The guide-rail fixing bracket 620 and the guide-rail support bracket 610 may be coupled to each other through a connection adjustment part 611. That is, the connection adjustment part 611 is arranged between the guide-rail fixing bracket 620 and the guide-rail support bracket 610 to connect them to each other. Thus, the guide rail 200 is floated while being supported by the guide support 400.

[0063] A height at which the guide rail 200 is located may be adjusted by adjusting a distance between the guide-rail fixing bracket 620 and the guide-rail support bracket 610 using the connection adjustment part 611.

[0064] FIG. 5 is a diagram illustrating adjustment of the height of a guide-rail fixing bracket. Referring to FIG. 5, a screw thread is formed on an outer circumference surface of the connection adjustment part 611, and one end of the connection adjustment part 611 is meshed with the guide-rail support bracket 610 and another end thereof is meshed with the guide-rail fixing bracket 620. Since the guide-rail support bracket 610 is coupled to the guide support 400 fixed at the power conduit 100, the guide-rail fixing bracket 620 is moved close to or away from the guide-rail support bracket 610 according to a direction of rotation of the connection adjustment part 611 when the connection adjustment part 611 is rotated.

[0065] For example, when the guide-rail fixing bracket 620 is moved close to the guide-rail support bracket 610, the guide rail 400 fixed on the guide-rail fixing bracket 620 is also moved close to the guide-rail support bracket 610 and is thus far from the bottom of the power conduit 100. Thus, a height at which the guide rail 200 is located is increased. In contrast, when the guide-rail

fixing bracket 620 is moved away from the guide-rail support bracket 610, the guide rail 400 fixed on the guide-rail fixing bracket 620 is also moved away from the guide-rail support bracket 610 and is thus away from the bottom of the power conduit 100. Thus, a height at which the guide rail 200 is located is decreased.

[0066] A place in which the cable 10 is installed, e.g., the power conduit 100 or a submarine tunnel, may be curved horizontally or vertically. Thus, according to the present invention, the height of the guide rail 200 may be adjusted appropriate for the power conduit 100 or the submarine tunnel which is curved vertically by changing the distance between the guide-rail fixing bracket 620 and the guide-rail support bracket 610 using the connection adjustment part 611 as described above. Accordingly, the cable 100 may be transferred more stably along the guide rail 200.

[0067] The moving cart 300 may include a body part 301 configured to be movable along the guide rail 200, and a plurality of rollers included in the body part 301 to be rotatably moved along the guide rail 200, as will be described with reference to FIGS. 6 to 9 below.

[0068] FIG. 6 is a perspective view illustrating a state in which a moving cart is fastened with a guide rail. FIG. 7 is a rear perspective view of a moving cart. FIG. 8 is a side view of a moving cart. FIG. 9 is a plan view of a moving cart.

[0069] The moving cart 300 may include the body part 301 supported by coupling the support belt 700 thereto below the lower flange 210 of the guide rail 200, a main roller 310 coupled to the body part 301 to be rotatable on the lower flange 210, first auxiliary rollers 320 coupled to the body part 301 to be rotated in contact with a side surface of the lower flange 210, and second auxiliary rollers 330 coupled to the body part 301 to be rotated in contact with a lower surface of the lower flange 210.

[0070] The main roller 310 may include at least two rollers to be in contact with two upper surfaces of the lower flange 210 divided by the wave 230. When the connection wire 20 is pulled out by the driving part 500, the main roller 310 may be rotated on an upper

surface of the lower flange 210 to move the moving cart 300 along the guide rail 200.

[0071] The first auxiliary rollers 320 may be arranged to correspond to opposite side surfaces of the lower flange 210. For example, as illustrated in FIGS. 6 to 9, a total of four first auxiliary rollers 320, including two first auxiliary rollers 320 on front left and right sides of the body part 301 and two first auxiliary rollers 320 on rear left and right sides of the body part 301, may be provided. The first auxiliary rollers 320 are rotated in contact with the opposite side surfaces of the lower flange 210 and thus the axes of rotation of the first auxiliary rollers 320 may be parallel to the wave 230 of the guide rail 200. Since the first auxiliary rollers 320 are arranged at the front and rear parts of the body part 301 to be in contact with opposite side surfaces of the guide rail 200, the moving cart 300 may be prevented from deviating to a left or right side of the guide rail 200 when the moving cart 300 is moved along the guide rail 200. When the guide rail 200 has a curved part in a left or right direction, friction between the guide rail 200 and the moving cart 300 may be decreased.

[0072] The second auxiliary rollers 330 may be arranged between the lower surface of the lower flange 210 and the body part 301. For example, a total of four second auxiliary rollers 330, including two second auxiliary rollers 330 at left and right sides of the front part of the body part 301 and two second auxiliary rollers 330 at left and right sides of the rear part of the body part 301, may be installed as illustrated in FIGS. 7 to 9. The second auxiliary rollers 330 are rotated in contact with the lower surface of the lower flange 210 and thus the axes of rotation of the second auxiliary rollers 330 may be parallel to the lower surface of the lower flange 210 of the guide rail 200. Since the second auxiliary rollers 330 are arranged on the front and rear parts of the body part 301 to be in contact with the lower surface of the lower flange 210 of the guide rail 200, the moving cart 300 may be prevented from being

directly bumped against the lower flange 210 even when the guide rail 200 has a curved part in a vertical direction and thus the body part 301 is moved upward during moving of the moving cart 300 along the curved part of the guide rail 200. Thus, when the guide rail 200 has a curved part in the vertical direction, friction between the guide rail 200 and the moving cart 300 may be decreased.

[0073] The moving cart 300 may include the support belt 700 supporting the cable 10. The support belt 700 sags below the body part 301 and a material thereof may be selected such that the support belt 700 has hardness and flexibility appropriate to support the cable 10.

[0074] If slip occurs between the cable 10 and the support belt 700 when the cable 10 is moved by moving the moving cart 300, the cable 10 is not moved and only the moving cart 300 is moved. Thus, a friction member (not shown) may be provided at an inner side of the support belt 700 to prevent the cable 10 from slipping. The friction member may prevent the cable 10 from slipping by maximizing friction between the cable 10 and the support belt 700, thereby minimizing power loss.

[0075] A height of the cable 10 supported by the support belt 700 may be determined to correspond to that of the hanger 410 installed on the guide support 400. If the height of the cable 10 supported by the support belt 700 is different from that of the hanger 410, it is very inconvenient and difficult to place the cable 10 on the hanger 410 when the moving of the cable 10 is ended and the cable 10 is installed by placing it on the hanger 410. Thus, in order to solve problems of such inconvenience, a length to which the support belt 700 supporting the cable 10 sags is determined such that the height of the cable 10 supported by the support belt 700 corresponds to that of the hanger 410. When the height of the cable 10 supported by the support belt 700 corresponds to that of the hanger 410 as described above, the cable 10 may be very easily installed when the cable 10 is installed by placing it on the hanger 410.

[0076] As described above, a support belt may include a length adjustment part (not shown) to adjust a height of a cable. That is, when a plurality of hangers are formed at different heights on a guide support to install a plurality of cables, the cables may be moved by adjusting heights thereof according to the heights of the hangers by adjusting a length of the support belt using the length adjustment unit.

[0077] In a cable installation device according to the present invention, a guide rail is formed to correspond to a location of a hanger on which a cable is placed. Since the guide rail is formed above the hanger to be roughly aligned with the hanger, a cable transferred by a moving cart installed at the guide rail may be easily placed on the hanger. That is, a cable installation device according to the present invention transfers a cable according to a location at which the cable is to be finally installed, unlike in the conventional method using caterpillars or the conventional method using a battery car, in which a cable is transferred at a center of a power conduit. Thus, the transferred cable may be easily separated from the support belt and placed on the hanger below the support belt.

[0078] However, the cable transferred along the guide rail is moved close to a surface of a wall of a guide support or the power conduit. In this case, during the moving of the cable, the cable may be bumped against the surface of the wall of the guide support or the power conduit and be thus damaged. Thus, the cable installation device according to the present invention may further include a cable guide roller 430 to prevent the cable from being moved in a left or right direction during the moving of the cable, thereby preventing the cable from being damaged.

[0079] In addition, the cable installation device may include a connection-wire guide roller 420. The connection-wire guide roller 420 may prevent a cable-connection wire from sagging.

[0080] A cable installation device according to an embodiment of the present invention may further include a moving-cart

monitoring part illustrated in FIG. 10. The cable is placed on a plurality of support belts and may thus be minimized from being bent between the support belts by maintaining the distances between the support belts constant. Thus, a moving distance of the moving
5 cart may be monitored using the moving-cart monitoring part so that a worker may place the cable on the support belts by installing the moving cart at predetermined intervals. The moving-cart monitoring part may include a first monitoring device and a second monitoring device. When a cable is installed using the cable
10 installation device according to the present invention, a worker may be located at a point at which transferring of the cable starts and place the cable on the support belt of the moving cart. In this case, the first monitoring device may generate a signal for guiding a preparatory work to be performed to place the cable on
15 the support belt, and the second monitoring device may generate a signal for guiding a work to be performed to place the cable on the support belt. In detail, the first and second monitoring devices may monitor a moving distance of the moving cart by checking a time point when a preceding moving cart is moved and generating
20 a signal or the like a predetermined time after the time point. The signal may be an audio signal.

[0081] The cable installation device according to the present invention may further include a tensile-force monitoring device illustrated in FIG. 11. The tensile-force monitoring device may
25 include a load cell, and monitor a tensile force applied to a connection wire to determine an operating state of the cable installation device when the cable is moved.

[0082] Although exemplary embodiments of the present invention are described in the present disclosure, it would be apparent to
30 those of ordinary skill in the art that the present invention may be embodied in many different forms without departing from the idea and scope of the invention as defined in the appended claims. Therefore, the scope of the invention should be defined by the appended claims, and all differences within the scope will be

construed as being included in the present invention.

CLAIMS

【Claim 1】

A cable installation device comprising:

5 a guide rail included in a power conduit;

a moving cart fastened with the guide rail to be moved along the guide rail;

a sling belt coupled to the moving cart to support a cable, and configured to be moved together with the moving cart; and

10 a driving part configured to move the moving cart along the guide rail, and

wherein the driving part transfers the cable by pulling out a connection wire connected to the cable to guide the moving cart to be moved along the guide rail, and

15 wherein the driving part comprises a winch configured to apply driving power to pull out the connection wire and a winding part configured to wind the pulled-out connection wire.

【Claim 2】

20 The cable installation device of claim 1, wherein the guide rail comprises an I-beam or an H-beam including an upper flange, a lower flange, and a wave connecting the upper and lower flanges.

【Claim 3】

The cable installation device of claim 2, further comprising:

a guide-rail fixing bracket configured to fix the upper flange;

25 a guide-rail support bracket coupled to a guide support arranged in the power conduit; and

a connection adjustment part arranged between the guide-rail fixing bracket and the guide-rail support bracket, and configured to adjust a distance between the guide-rail fixing bracket and the
30 guide-rail support bracket.

【Claim 4】

The cable installation device of claim 3, wherein the connection adjustment part comprises a screw thread on an outer circumference surface thereof to be meshed with the guide-rail support bracket,
5 and

the distance between the guide-rail fixing bracket and the guide-rail support bracket is adjusted by rotating the connection adjustment part.

【Claim 5】

10 The cable installation device of claim 2, wherein the moving cart comprises:

a body part supported by coupling the sling belt thereto below the lower flange;

15 a main roller coupled to the body part to be rotatable on the lower flange;

first auxiliary rollers coupled to the body part to be rotated in contact with a side surface of the lower flange; and

second auxiliary rollers coupled to the body part to be rotated in contact with a lower surface of the lower flange,

20 wherein when the connection wire is pulled out by the driving part, the main roller is rotated on the lower flange to move the moving cart along the guide rail.

【Claim 6】

25 The cable installation device of claim 5, wherein the first auxiliary rollers are arranged to correspond to opposite side surfaces of the lower flange, and prevent the moving cart from deviating to a left or right side of the guide rail when the moving cart is moved along the guide rail.

【Claim 7】

30 The cable installation device of claim 5, wherein the second

auxiliary rollers are arranged between the lower surface of the lower flange and the body part, and configured to prevent the body part from being raised and bumped against the lower flange.

【Claim 8】

5 A method of installing a cable in a power conduit using the cable installation device of any one of claims 1 to 7, the method comprising:

 installing the cable installation device in the power conduit;
and

10 transferring the cable using the cable installation device, wherein the cable installation device comprises:

 the moving cart configured to be moved inside the power conduit to transfer the cable; and

 the driving part configured to move the moving cart.

15 **【Claim 9】**

 The method of claim 8, wherein the installing of the cable installation device comprises:

 installing a rail fixing part at a guide support formed at a side of the power conduit;

20 installing the guide rail on the rail fixing part; and

 installing the moving cart to be movable along the guide rail, the moving cart configured to move the cable.

【Claim 10】

 The method of claim 8, wherein the cable installation device
25 further comprises a support belt coupled to the moving cart to support the cable and configured to be moved together with the moving cart, and

 the transferring of the cable comprises:

 supporting the cable by placing the cable on the support belt;

30 and

 transferring the cable by pulling out the connection wire

connected to the cable by the driving part to move the moving cart along the guide rail.

【Claim 11】

The method of any one of claims 8 to 10, wherein the driving
5 part comprises:

the winch configured to provide driving power to pull out the connection wire; and

the winding part configured to wind the connection wire, and
the transferring of the cable comprises transferring the cable
10 by pulling out the connection wire using only a turning force applied by the winch and winding the connection wire around the winding part by controlling a speed of rotation of the winding part.

【Claim 12】

The method of claim 9, wherein the guide rail comprises an
15 I-beam or an H-beam including an upper flange, a lower flange, and a wave connecting the upper flange and the lower flange.

【Claim 13】

The method of claim 12, wherein the rail fixing part comprises:
a guide-rail fixing bracket configured to fix the upper flange;
20 a guide-rail support bracket coupled to a guide support arranged in the power conduit; and

a connection adjustment part arranged between the guide-rail fixing bracket and the guide-rail support bracket, and configured to adjust a distance between the guide-rail fixing bracket and the
25 guide-rail support bracket, and

the installing of the cable installation device further comprises adjusting the distance between the guide-rail fixing bracket and the guide-rail support bracket using the connection adjustment part.

【Claim 14】

The method of claim 13, wherein the connection adjustment part comprises a screw thread on an outer circumference surface to be meshed with the guide-rail support bracket, and

the distance between the guide-rail fixing bracket and the guide-rail support bracket is adjusted by rotating the connection adjustment part.

【Claim 15】

The method of claim 12, wherein the moving cart comprises:
a body part being supported by coupling the sling belt thereto
below the lower flange;

a main roller coupled to the body part to be rotatable on the lower flange;

first auxiliary rollers coupled to the body part to be rotated in contact with a side surface of the lower flange; and

second auxiliary rollers coupled to the body part to be rotated in contact with a lower surface of the lower flange, and

when the connection wire is pulled by the driving part, the main roller is rotated on the lower flange to move the moving cart along the guide rail.

【Claim 16】

The method of claim 15, wherein the first auxiliary rollers are arranged to correspond to opposite side surfaces of the lower flange, and prevent the moving cart from deviating to a left or right side of the guide rail when the moving cart is moved along the guide rail.

【Claim 17】

The method of claim 15, wherein the second auxiliary rollers are arranged between a lower surface of the lower flange and the body part to prevent the body part from being raised and bumped against the lower flange.

【Claim 18】

The method of claim 10, wherein the supporting of the cable comprises monitoring a moving distance of the moving cart and placing the cable on the support belt.

5 **【Claim 19】**

The method of claim 10, wherein the guide support comprises at least one hanger configured to place the transferred cable thereon,

10 the guide rail is formed on the guide support to be spaced a certain distance apart from the hanger in a direction roughly perpendicular to the hanger, and

the cable transferred by moving the moving cart along the guide rail is separated from the support belt and placed on the hanger.