

【DESCRIPTION】

【Invention Title】

DEVICE FOR LAYING POWER LINES USING GRIPPER TECHNIQUES

【Technical Field】

5 The present invention relates to a device for laying a power line through a gripper technique, and more particularly to a device for laying a power line through a gripper technique, which is installed with a light, thin, small, and compact structure at a place, such as a cable
10 tray on a ship, which limits the access of a worker.

【Background Art】

 In general, a work of laying a cladded power line having a multi-core requires significantly much labor. As various devices for laying a power line are introduced, the
15 efficiency of laying the power line is gradually increased. Nevertheless, a work of laying the power line in a cable tray installed on a narrow place, such as a ship, or a marine plant still depends on the hand of a worker. Above all, much labor is required, so that the musculoskeletal
20 disorders of workers may be easily caused. Accordingly, the efficiency of the work may be degraded.

 For a device for laying a power line, electric/engine/pneumatic winch laying machine, a roller/caterpillar/ball shape puller and feeder, and a
25 robot for towing a guide rope are mainly used. However,

most devices are heavy and have a large size suitably for a linear type power line. Accordingly, the devices may not be applied to a narrow space or a power line vertically connected with a curved line.

5 In the case of a ship or a plant, since most of power lines have sections perpendicular to the curved line, a new cable laying system is required. The device for the system requires small, light, high-rate, and high power characteristics.

10 As prior arts for references, Korean Patent Registration No. 120592, and Korean Utility Model Registration No. 0454764 have been generally known. According to Korean Patent Registration No. 120592, a whole length including that of a towing unit is increased, so
15 that the installation is difficult at a narrow space.

 According to Korean Utility Model Registration No. 0454764 as another prior art, the reliability and the durability may be deteriorated as a structure is complicated.

20 **【Disclosure】**

【Technical Problem】

 In order to solve the above problems, an object of the present invention is to provide a device for laying a power line through a gripper technique, which can be installed in
25 a light, thin, small, and compact structure at a narrower

place that does not limit the access of a worker and causes the poor posture of the worker, thereby reducing the number of workers and time number for a power line laying work.

Another object of the present invention is to prevent
5 a cable from being dropped in a vertical section of a cable tray.

【Technical Solution】

In order to accomplish the above object, there is provided a device for laying a power line on a wire pathway
10 having a plurality of trays through a gripper technique. The device includes at least one driving unit provided on the wire pathway to form force of laying the power line through reciprocal movement of an actuator, and a gripping unit to grip the power line and to transfer the laying
15 force to the power line in synchronization with the driving unit.

According to the detailed configuration of the present invention, the the gripping unit includes one of a car-type gripper, a U-type gripper, and a bubble-type gripper.

20 According to another embodiment, there is provided a device for laying a power line through a gripper technique by applying force of laying the power line to transfer the power line onto a preset pathway. The device includes a movable body having a link movable in a forward-backward

direction of the power line, and a gripping unit including a gripper to grip the power line in linkage with the link.

According to the detailed configuration of the present invention, the gripper of the gripping unit includes at least one of a wire rod, a belt, a U-shaped rod, and a one-way roller.

According to the detailed configuration of the present invention, the gripper includes at least one of a wire rope, a chain, fiber, and resin when the gripper is the wire rod.

According to the detailed configuration of the present invention, the gripper further includes at least one of a plurality of blocks, screws, and engaged concavo-convex patterns corresponding to a diameter of the power line.

According to the detailed configuration of the present invention, the gripping unit further includes a locking member to attach and detach the gripper, and the locking member employs at least one of a pocket, a bracket, and a screw.

According to the detailed configuration of the present invention, the gripper of the gripping unit includes a cladding material formed of at least one of air hose, vinyl, leather, fiber, and rubber to prevent the power line from being damaged.

According to still another embodiment of the present invention, there is provided a device for laying a power

line through a gripper technique by transferring the power line. The device includes a base having a hinge shaft, and a link rotatably mounted on the hinge shaft of the base and having a wire rope for coupling the power line.

5 According to the detailed configuration of the present invention, the wire rope of the link includes a plurality of spherical members to adjust a coupling length of the wire rope of the link.

10 According to the detailed configuration of the present invention, the link includes a ball plunger to support the wire rope.

 According to the detailed configuration of the present invention, the link includes a fixing groove and a ball pocket to support the wire rope.

15 In addition, the fixing groove and the ball pocket have side grooves for entering of the wire rope.

 According to the detailed configuration of the present invention, the side groove communicating with the ball pocket has a chamfered part or a rounded part at an entrance thereof.

20 According to the detailed configuration of the present invention, the fixing groove and the ball pocket have a side groove and an L-shaped groove, respectively, for entering of the wire rope.

According to still another embodiment of the present invention, there is provided a device for laying a power line through a gripper technique. The device includes a body having a predetermined length and a predetermined width, a locking part protruding to one side from an upper end and a lower portion of the body, a mounting part having a gripper at an intermediate portion of the body, and a fixing unit to fix the body to a cable tray.

According to the detailed configuration of the present invention, the locking part has a multi-stage step such that the locking part is mounted on cable trays having mutually different shapes.

According to the detailed configuration of the present invention, one of an eye gripper, a belt gripper, and a wedge-type gripper is fixed to the mounting part.

According to the detailed configuration of the present invention, the body is formed therein with a rectangular hole to vary a fixing position of the fixing unit and with a cover to cover the rectangular hole.

According to the detailed configuration of the present invention, the fixing unit includes a bolt movably fixed into the rectangular hole of the body, and a knob coupled to a rear surface of the body by the bolt.

【Advantageous Effects】

As described above, according to the present invention, the device for laying the power line through a gripper technique can be installed in a light, thin, small, and compact structure at a narrower place, such as a ship or a marine plate, that does not limit the access of a worker and causes the poor posture of the worker, thereby reducing the number of workers and time number for the power line laying work.

【Description of Drawings】

FIG. 1 is a view showing a system for laying a wire according to the present invention.

FIG. 2 is a block diagram showing the connection state of a main component in the system for laying the wire shown in FIG. 1.

FIGS. 3 to 5 are views showing variations of a gripping unit of FIG. 1.

FIG. 6 is a view showing the installation state of the gripping unit of FIG. 1.

FIG. 7 is a block diagram showing a driving unit and a control unit of FIG. 1.

FIG. 8 is a view showing a device for laying a wire according to the present invention.

FIG. 9 is a schematic view showing a main component of FIG. 8.

FIGS. 10 and 11 are schematic views showing the operating state of FIG. 4.

FIG. 12 is an exploded perspective view showing a gripper for laying a wire according to the present invention.

FIG. 13 shows a plan view and a longitudinal sectional view showing a modification of FIG. 12.

FIG. 14 shows a plan view and a longitudinally sectional view showing another modification of FIG. 12.

FIG. 15 is a longitudinally sectional view showing the use state of FIGS. 12 to 14.

FIGS. 16 to 18 are exploded perspective views showing a vertical tray clamp according to the present invention.

FIGS. 19 to 21 are views showing the structure of a gripper applied in FIG. 16.

【Best Mode】

【Mode for Invention】

Hereinafter, an embodiment of the present invention will be described in detail with reference to accompanying drawings.

FIG. 1 is a view showing a system for laying a power line 150 on a wire pathway having a plurality of trays 110, 120, 130. The wire pathway includes a horizontal tray 110, a vertical tray 120, and a corner tray 130. The narrow wire pathway in a ship or a marine plant includes a plurality of

straight lines and curved lines and has a long length. The wire pathway of the curved line is formed at a plurality of points including the corner tray 130.

According to the present invention, a gripping unit
5 300 is provided on the wire pathway. The gripping unit 300 automatically grips or releases a driving unit 400 in the reciprocal movement of the driving unit 400. The gripping unit 300 is introduced to easily lay the power line on the wire pathway. A conventional winch laying machine is used
10 to mainly lay a thick power line on a straight-shaped wire pathway. When a cable is laid on a very long wire pathway, a roller is mainly used to reduce the friction between the cable and the wire pathway. Nevertheless, since significantly great tensile force is applied to the power
15 line, the power line may be damaged.

In particular, when a curved wire pathway and a straight wire pathway are mixed, since significantly great force is applied to the curved wire pathway, the power line may be broken. Accordingly, when the curved wire pathway is
20 used together, there is a limitation in the use of the winch.

According to the detailed configuration of the present invention, the gripping unit 300 includes the selective combination of a car-type gripper 331, a U-type gripper 333,
25 and a bubble-type gripper 335. The car-type gripper 331

restricts the movement of the power line 150 by rotating an arm, and the U-type gripper 333 restricts the movement of the power line 150 as a U-shape band is moved up and down. The bubble-type gripper 335 induces the expansion and the shrinkage of the band by pneumatic pressure to restrict the movement of the power line 150. The car-type gripper 331, the U-type gripper 333, and the bubble-type gripper 335 may be provided in a compact size to be easily installed in narrow trays 110, 120, and 230.

Meanwhile, as shown in FIG. 6, the small car-type gripper 331, the U-type gripper 333, and the bubble-type gripper 335 employ their respective clamp 227, so that the car-type gripper 331, the U-type gripper 333, and the bubble-type gripper 335 are tightly supported on the top and bottom surfaces of the trays 110, 120, and 130.

In addition, according to the present invention, the driving unit 400 to draw the power line 150 through the reciprocal movement of an actuator is synchronized with the gripping unit 300 at a plurality of points of the wire pathway. Since the gripping unit 300 is intermittently installed at the trays 110, 120, and 130, the tensile force to be applied to the power line 150 is not great. Accordingly, the driving unit 400 may be provided in a compact size. If the tensile force of the power line 150 is

great, devices such as conventional winch, drawer, and feeder may be operated together with the driving unit 400.

According to the detailed configuration of the present invention, the driving unit 400 includes a switch 410, a control valve 412, and a time delay valve 415 to adjust the operating timing between actuators. The driving unit 400 properly includes a pneumatic actuator for reciprocal movement. However, the driving unit 400 may include a hydraulic cylinder, electric, or engine-type actuator. The actuator operation is performed through the configuration including the switch 410, the control valve 412, or the time delay valve 415 as shown in FIG. 7. The switch 410 employs a lever manually manipulated by a worker. The control valve 412 performs functions such as "start", "stop", or "reset". The time delay valve 415 makes a difference between a start time point and a stop time point of devices including the gripping unit 300 and the driving unit 400. In addition, as shown in FIG. 7, the electric circuit may be used together with the pneumatic circuit.

In addition, according to the present invention, the control unit 500 is distributed to a unit controller 510 and a central controller 520 to control the gripping unit 300, and the driving unit 400. The unit controller 510 is installed according to set regions of the trays 110, 120, and 130, and the central controller 520 is a plurality of

unit controllers 510 at a place for convenient manipulation.
A wireless operator 530 may be interposed between the unit
controller 510 and the central controller 520.

FIG. 8 shows a device to apply wire laying force to a
5 preset pathway to lay the wire. In the case of a ship, a
cable tray 100 to support the power line 150 is narrowed
and complicated, and provided in horizontal, vertical, and
curved shapes at a high position. The device 160 for laying
the power according to the present invention aims at the
10 cable tray 100 of the ship and the marine plant having
inferior installation conditions, but the present invention
is not limited thereto.

The device 160 for laying the power line according to
the present invention includes a movable body 210, a
15 gripping unit 300, and a driving unit 400 as main
components. Hereinafter, the details of the main components
will be described.

The movable body 210 according to the present
invention has a structure of having a link 220 movable in a
20 forward-backward direction of the power line 150. The
movable body 210 is configured based on a frame so that the
movable body 210 is fixed to the cable tray 100, and
receives the link 220 on the frame so that the link 220 is
movable forward/backward. The 'forward-backward movement'
25 represents movement in a direction in which the power line

150 is laid. Accordingly, the 'forward/backward' includes all of horizontal, vertical, and curved directions which represent the pathway of the cable tray 100. The forward/backward movement of the link 220 is not limited to
5 the linear movement, but includes rotation movement.

According to the detailed configuration of the present invention, the link 220 of the movable body 210 is moved together with the power line 150 only in one-way movement. Accordingly, the link 220 may move together with the power
10 line 150 in the forward movement by applying the frictional force to the power line 150. In the backward movement, the link 220 may move backward separately from the power line 150. The above one-way wire laying force is applied through the mechanical mechanism to be described later, which is a
15 main component to simplify the whole structure.

In this case, a hinge shaft 223 is detachably installed to couple the movable body 210 to the link 220 as at least one of a splitting pin, a snap ring, and a key is interposed between the movable body 210 and the link 220.
20 In addition, a stopper 225 is interposed between the movable body 210 and the link 220 so that the forward-backward movement range is restricted.

In addition, the gripping unit 300 according to the present invention has a gripper 310 to grip the power line
25 150 in linkage with the link 220. The gripper 310 is a main

component to restrict the laying force for the power line 150 together with the above-described link 220. Although one gripper 310 is generally applied to one link 220, a plurality of grippers 310 may be applied to one link 220.

5 Through the detailed configuration of the present invention, the gripper 310 of the gripping unit 300 may employ at least one of a wire rod, a belt, a U-shaped rod, and a one-way roller. The wire rod is a flexibly bendable member and advantageous in the detaching/attaching
10 (loading/unloading) of the power line 150. The belt has the flexibility such as the wire rod and a wider width. If necessity, the belt may be provided on an inner surface thereof with a concavo-convex pattern. The U-shaped rod is not inconvenient when the power line 150 is detached or
15 attached, but has durability improved to high strength. The one-way roller has a structure in which a roller is combined with a one-way clutch, and disadvantage in terms of a light, thin, small, and compact structure. However, the one-way roller may minimize the frictional force in the
20 backward movement. The wire rod, belt, U-shaped rod, and the one-way roller of the gripper 310 may be used individually or integrally.

 In this case, when the gripper 310 is the wire rod, at least one of a wire rope, a chain, fiber, and resin may be
25 used. The wire rope prefers steel, but may include fiber or

resin. The chain is disadvantage in the light, thin, small, and compact structure, but may be partially replaced easily in cutting. The fiber and resin may be used for a single core having high strength or a coaxial cable.

5 Meanwhile, it is preferred that the gripper 310 includes at least one of a plurality of blocks, screws, and engaged concavo-convex patterns corresponding to the diameter of the power line 150. When the configuration to adjust a length is applied to the gripper 310, the power
10 line 150 may be used without change even if the diameter of the power line 150 is varied. The blocks preferably include a spherical body, a polyhedral body, or a conical body formed of a metallic material, but may be at least partially replaced with a nut which is a standard product.
15 In any case, the block is coupled to a predetermined section of the wire rod, and the wire rod is spread at a desirable point to form a gap so that the wire rod is coupled to the link 220. In addition, a portion of the wire rod is coupled to a spiral line, a concavo-convex part is
20 engaged with the wire rod, and a screw-based pressing scheme is applied to one side of the wire rod, so that the length of the gripper 310 may be adjusted.

According to the detailed configuration of the present invention, the gripping unit 300 further includes a locking
25 member 315 to detach or attach the gripper 310, and the

locking member 315 may employ at least one of a pocket, a bracket, and a screw. One end of the gripper 310 is securely fixed to the link 220, and an opposite end of the gripper is detachably fixed to the locking member 315. When
5 a wire rod is used as the gripper 310, and a plurality of blocks are coupled to the wire rod, a pocket, which may be engaged with the block, is formed in the link 220. On the same principle, the locking member 315 may include a bracket or a screw depending on the gripper 310 or a manner
10 of adjusting the length of the gripper 310.

According to the detailed configuration of the present invention, the gripper 310 of the gripping unit 300 further includes a cladding material 313 formed of at least one of an air hose, vinyl, leather, fiber, and rubber to prevent
15 the power line 150 from being damaged. When the pressing force of the gripper 310 coupled to the link 220 is applied to the power line 150, the cladding of the power line 150 may be damaged due to the heavy load. In order to prevent the above problems, the cladding material 313 having a high
20 frictional coefficient and wear resistance is applied to an outer surface of the gripper 310. The cladding material 313 includes at least one of an air hose formed of a resin material, vinyl, leather, fiber, and rubber. If there is no risk of damaging the power line 150, the cladding material
25 313 may not be used.

In addition, the driving unit 400 according to the present invention has a structure of applying laying force to the power line 150 by inducing the movement of the link 220 and the gripper 310. The forward/backward movement of the link 220 and the gripper 310 is performed on the movable body 210 by the driving unit 400. As described above, only in one-way movement of the driving unit 400, the wire laying force is applied to the power line 150.

The control unit 500 according to the present invention has various circuit configurations depending on hydraulic schemes and electrical schemes.

Regarding the operation, as shown in FIG. 10, the link 220 is moved forward while being inclined backward together with the gripper 310 to maximize the sliding frictional force to apply the laying force to the power wire. As shown in FIG. 11, the link 220 is moved backward while being inclined forward together with the gripper 310 to remove the sliding frictional force, so that the power line 150 is located at the position thereof without change. The forward inclination and the backward inclination of the link 220 are induced by restricting a forward/backward angle of the stopper 225. For reference, the directions of applying the wire laying force may be varied depending on the installation directions of the movable body 210 and the gripping unit 300.

FIG. 12 shows the device for laying the power line 150, particularly, the device for laying the power line 150 through the gripper technique. If the device based on the gripper technique is used, the power line 150 may be easily laid on the pathway at a narrower space such as a cable tray of a ship. The power line 150 aims at a large-scale wire having a large diameter and heavy weight, but the present invention is not limited thereto.

In the following description, "forward", "front", "forward", "rear", "back", "backward" is defined based on the movement directions of the wire while the wire is drawn.

According to the present invention, a base 211 is provided with therein a hinge shaft 223. The base 211 is a part to support the link 220 to be described later and fixed to the actuator (not shown) by a bolt. The hinge shaft 223 to couple the link 220 to the base 211 is installed in a structure that can be easily detached using a snap pin.

In addition, according to the present invention, the link 220 having the wire rope 320 is rotatably mounted on the hinge shaft 223 of the base 211 to couple the power line 150. The link 220 has a semi-circular structure having an open upper portion, and the hinge shaft 223 of the base 211 is coupled to a lower portion of the link 220. The wire rope 320 employs steel or a fiber material and has a

cladding by a predetermined section in order to increase the frictional force of the power line 150.

In this case, the base 211 has the stopper 25 to restrict the movement range of the link 220. The stopper 225 is provided in the form of a groove or a protrusion on a part of the base 211 close to the link 220. The stopper 225 induces the rotation movement of the link 220 at a predetermined angle about a vertical line while the power line 150 is laid.

According to the detailed configuration of the present invention, the wire rope 320 of the link 220 includes a plurality of spherical members 321 to adjust the coupling length. The spherical members 321 are coupled to each other with a slight gap therebetween throughout a predetermined section of the wire rope 32. The gap between the spherical members 321 is used to be inserted into an incision part formed in one side of the link 220 for the coupling of the link 220. The diameter of the spherical member 321 is a factor to determine the coupling length (diameter) of the wire rope 320 corresponding to the variation in the thickness of the power line 150.

According to the detailed configuration of the present invention, the link 220 has a ball plunger 323 to support the wire rope 320. The ball plunger 323 includes a ball and a spring to be received in the groove of the link 220 to

prevent the wire rope 320 from being arbitrarily deviating from the link 220 by elastic force applied to the ball. In addition, the ball of the ball plunger 323 does not require a spherical shape at an entire portion thereof but the ball
5 may have a semi-spherical shape at a portion thereof.

In this case, the link 220 further includes a frictional shoe 325 to apply one-way slip resistance to the power line 150. The frictional shoe 325 is coupled to one surface of the link 220 so that the frictional resistance
10 may be applied to the cladding of the power line 150.

FIG. 13 shows the modification of FIG. 12, and shows a locking tool for the attaching and the detaching of the power line 150 by the gripper for the wire laying. The device for laying the power line through the gripper
15 technique may be realized in a light, thin, short, and compact structure, and proper when laying the power line in a horizontal, vertical, or curved shape at a narrow, high, and deep place such as a cable tray. The gripper performs reciprocal movement in the movement direction of the power
20 line to apply frictional force in one direction. The base 211 according to the present invention is coupled to a hydraulic or pneumatic cylinder (not shown) to perform the reciprocal movement while providing drawing force to the power line. In addition, according to the present invention,
25 the link 220 is mounted on the base 211 by interposing the

hinge shaft 223 therebetween. In addition, the link 220 is formed in a semi-spherical sectional surface to support the lower portion of the power line.

5 The link 220 is coupled to 211 by interposing the hinge shaft 223 between the link 220 and the base 111 to perform rotation movement in the forward and backward directions within a preset angle range. The backward inclination angle of the link 220 at the time point that the power line is drawn due to the forward movement is set
10 to be greater than the forward inclination angle of the link 220 at the time point that the power line slides due to the backward movement.

According to the detailed configuration of the present invention, the link 220 includes a fixing groove 231 and a
15 ball pocket 235 to support the wire rope 320. The fixing groove 231 tightly supports one end of the wire rope 320, and the ball pocket 235 easily detachably supports an opposite end of the wire rope 320. A coupling groove 233 is formed in a peripheral portion of the fixing groove 231,
20 and a separation pin 318 is coupled to the coupling groove 233 to prevent the arbitrary separation of the wire rope 320. The ball packet 235 is formed in a semispherical shape to tightly receive one of the spherical members 321 of the wire rope 320. Accordingly, during the forward movement of
25 the link 220 inclined in the backward direction, the wire

rope 320 maintains the tight coupling state by the ball pocket 235.

According to the detailed configuration of the present invention, the fixing groove 231 and the ball pocket 235
5 have side grooves 232 for the entering of the wire rope 320. The side grooves 232 are formed perpendicularly to forward-backward directions to allow the wire rope 320 to pass therethrough. The fixing groove 231 communicates with the side groove 232 at one side of the link 220, and the ball
10 pocket 235 communicates with the side groove 232 at an opposite side of the link 220. Since the wire rope 320 reaches the ball pocket 235 through the side groove 232, the wire rope 320 can be rapidly coupled. In this case, since the wire rope 320 may be spread and separated due to
15 the elastic force, the coupling groove 233 and the separation pin may be provided.

According to the detailed configuration of the present invention, the side groove 232 communicating with the ball pocket 235 has a chamfered part or a rounded part at the
20 entrance thereof. When the wire rope 320 is mounted on the link 220, the spherical member 321 may rapidly enter the side groove through the chamfered or rounded part. The chamfered or rounded part is formed at all contact parts with the spherical member 321 during the pass of the
25 spherical member 321. In addition, a chamfered part 238 may

be formed on the top surface of the link 220 so that the spherical member 321 is securely mounted.

In use, the power line is placed on the link 220 in the state that the opposite end of the wire rope 320 is released, the gap of the spherical member 321 is spread at the opposite end of the wire rope 320, and the power line is inserted into the side groove 232 formed at the opposite end of the link 220. In this case, the lower spherical member 321 is provided at the lower ball pocket 235, and the upper spherical member 321 is mounted in the chamfered part 238. Thereafter, the base 211 is operated to induce the forward/backward movement of the link 220. In this case, the power line is drawn in one way due to the linkage among the wire rope 320, the link 220, and the frictional shoe 325.

FIG. 14 is still another modification of FIGS. 12 and 13, and the configurations of FIGS. 12 and 13 have equivalence with the configuration of FIG. 14 in terms of the link 220, the fixing groove 231, and the ball pocket 235.

According to the above configuration, the fixing groove 231 and the ball pocket 235 have a side groove 232 and an L-shaped groove 236, respectively, for the entering of the wire rope 320. The side grooves 232 refer to grooves formed perpendicularly to forward-backward direction to

allow the wire rope 320 to pass therethrough. The L-shaped groove 236 has a passage bent in two directions of the forward-backward direction and a lateral direction. The fixing groove 231 and the side groove 232 communicate with each other at one side of the link 220, and the ball pocket 235 communicates with the L-shaped groove 236 at an opposite side of the link 220. Since the wire rope 320 reaches the ball pocket 235 through the L-shaped groove 236, the tight coupling state is maintained after mounting. In other words, the spreading of the L-shape groove 236 is restricted due to the elastic force of the wire rope 320, so that the the separation pin 318 is not required.

In this case, the crossing passages of the L-shaped groove 236 are maintained at an angle of 70° to 110° . The forward-backward directional passage and the laterally directional passage of the L-shaped groove 236 cross each other so that the passages are maintained at a right angle. However, the passages may cross each other at an acute angle or an obtuse angle within a preset angle range. If the crossing angle between the passages is a proper angle or less, the mounting of the wire rope 320 is inconvenient. If the crossing angle is the proper angle or more, the arbitrary separation of the wire rope 320 may be caused.

As shown in FIGS 16 to 18, a tray clamp 180 includes a body 200 having a predetermined length and a predetermined

width, clamps 227 protruding in one direction from an upper end and a lower portion of the body 200, mounting parts 218 having a gripper provided at an intermediate portion of the body 200, and a fixing unit 250 to fix the body 200 to the
5 cable tray.

The body 200 of the tray clamp 180 has a rectangular shape having a predetermined length and a predetermined width. The length of the body 200 is longer than an interval between cable trays.

10 In addition, auxiliary members 480 are rotatably fixed to an upper end and a lower end of the body 200, respectively. The auxiliary members 480 allow the power line to be gently bent when the power line is laid on an inclination portion and a bent portion of the cable tray to
15 protect the power line and the power line is smoothly moved at the bent portion.

The body 200 is formed in upper and lower portions thereof with elongated holes 213 for the mounting of the fixing units 250. The rectangular hole 213 facilitates the
20 mounting of the fixing unit 250 when the fixing unit 250 is mounted on the cable tray by changing the position of the fixing unit 250. In addition, a cover 214 is provided on the rectangular hole 213 to prevent the fixing unit 250 from being exposed.

In addition, the body 200 is formed in left and right longitudinal sides thereof with a plurality of fixing holes 215. Stiffening members 216 having a predetermined length are fixed to the fixing holes 215.

5 In other words, the stiffening member 216 enhances the strength of the body 200 to prevent the deformation or the damage to the body 200 resulting from the work of laying the power line.

10 The clamps 227 protrude from the body 200 to mount the cable tray therein. The clamps 227 are formed at the upper end and the lower portion of the body 200 while protruding from both lateral sides of the body 200 by a predetermined length.

15 A plurality of steps 228 are formed on the clamps 227 so that the cable tray is mounted on the clamps 227 regardless of the shape or the size of the cable tray. The steps 228 are stepwise formed from the distal ends of the clamps 227 toward the body 200.

20 The body 200 is formed therein with mounting parts 218. The mounting parts 218 allow the gripper (not shown) to be stably mounted on the intermediate position of the body 200. In other words, the mounting parts 218 have a plurality of holes formed at a predetermined interval so that the gripper is mounted in the body 200.

Meanwhile, the gripper may include an eye gripper 351, a belt gripper, or a wedge-type gripper. The gripper may include various types of grippers as long as the gripper can safely grip the power line.

5 In addition, the fixing unit 250 is mounted on the body 200. The fixing unit 250 includes a bolt 251 having a predetermined length and a knob 252 coupled to the bolt 251.

 The bolt 251 is movably fitted into the rectangular hole 213 formed in the body 200, and the knob 252 is
10 coupled to the bolt 251. The bolt 251 has a diameter shorter than a shorter length of the rectangular hole 213 so that the bolt 251 is movably fitted into the rectangular hole 213 along the rectangular hole 213.

 In addition, the knob 252 is coupled to a rear surface
15 of the cable tray by the bolt 251. The shape of the knob 252 is a T shape to facilitate the coupling between the knob 252 and the bolt 251.

 Hereinafter, the coupling relation of the vertical grip-type tray clamp according to an exemplary embodiment
20 of the present invention will be described in detail.

 As shown in FIGS. 16 and 19, the vertical grip-type tray clamp according to the present invention has a substantially C-shaped body 200. The auxiliary members 480 are rotatably fixed to the upper and lower ends of the body
25 200. The auxiliary member 480 is fixed by a fixing pin (not

shown) having a length longer than that of the auxiliary member 480.

The body 200 is formed at upper and lower portions thereof with the rectangular holes 213 having predetermined
5 lengths. The bolts 251 of the fixing units 250 are fitted into the rectangular holes 213 movably up and down. The covers 214 are provided on the rectangular holes 213 so that the bolts 251 are not exposed to the outside.

The body 200 is formed in left and right longitudinal
10 sides thereof with the fixing holes 215. The stiffening members 216 are inserted into the fixing holes 215 and maintained in a fixed state, or may be integrally fixed to the body 200 through welding.

In addition, the body 200 is provided therein with the
15 mounting parts 218 by forming a plurality of holes at a predetermined interval. The eye gripper 351 is mounted into the mounting parts 218 including a plurality of holes. As shown in FIGS. 19 to 21, one of the belt gripper 352 and the wedge-type gripper 353 is stably mounted in the
20 mounting parts 218.

The fixing unit 250 is fixed into the rectangular hole 213 of the body 200. The bolt 251, which is the fixing unit 250, is movably fitted into the rectangular hole 213. The knob 252 is engaged with the bolt 252.

In addition, the clamps 227 are formed at the upper ends and the lower portions of the lateral sides of the body 200 while protruding in one direction. The clamps 227 are formed on one plate and welded to the body 200 so that
5 the clamps 227 are fixed to the body 200.

A method of fixing the vertical grip-type tray clamp according to an exemplary embodiment of the present invention includes the steps of mounting a locking part of the clamp body, which includes the gripper mounting part
10 having the gripper fixed thereto, to the cable tray, and of fixedly coupling the knob to the rear surface of the cable tray by the bolt.

As shown in drawings, the tray clamps 180 according to the present invention are mounted to the cable tray, which
15 is vertically fixed, at a predetermined height interval. In other words, the whole shape of the cable tray (not shown) has a substantially ladder shape, and a plurality of cable trays 100 are horizontally fixed to the tray clamp 180 at a predetermined height interval.

20 The cable tray 100 is mounted on the tray clamp 180. The gripper is fixed to the mounting parts 218 of the body 200 by using the fixing units such as a bolt and a nut. As shown in FIGS. 19 to 21, one of the eye gripper 351, the belt gripper 352, and the wedge-type gripper 353 is fixed
25 to the mounting part 218.

In addition, a bolt 251, which is included in the fixing unit 250, is fitted into the rectangular hole 213 of the body 200 movably up and down and the cover 214 is fixed to the rectangular hole 213 to prevent the bolt 251 from deviating from the rectangular hole 213. In this case, the knob 252 engaged with the bolt 251 is in a separated state.

In addition, the stiffening member 216 is fitted into the fixing hole 215 of the body 200 for the fixing of the stiffening member 216 or integrally fixed to the fixing hole 215 through welding. The rotatable auxiliary members 480 are fixed to the upper ends of the lower ends of the body 200. The auxiliary members 480 are essentially fixed to the tray clamps adjacent to a part in which a direction is changed from the vertical section to the horizontal section.

Meanwhile, the auxiliary members 480 may not be fixed to the tray clamp mounted on the vertical section.

The tray clamp 180 having the grippers 351, 352, and 353, and the fixing unit 250 fixed thereto as described above moves the clamp 227 from the upper portion of the cable tray 100 to the rear surface of the cable tray 100 and then moves down.

As the tray clamp 180 is moved down, the clamp 227 is mounted on the cable tray 100, and the upper and lower clamps 227 are mounted on the cable tray 100 in the state

that the upper and lower clamps 227 are fitted into the cable tray 100.

In addition, the fixing unit 250 is fitted into the cable tray 100 by matching the bolts 251 with the slots 105
5 formed at a predetermined interval. Since the bolts 251 are fitted into the rectangular holes 213 movably up and down, the bolts 251 is vertically moved to be easily fitted into the slots 105.

In other words, the cable tray 100 is varied in size
10 and shape and the positions of the slots 105 are varied depending on the type thereof, such as a metallic cable tray, or an FRP cable tray.

Accordingly, a worker can fit the bolts 251 into the slots 105 by vertically moving the bolts 251.

15 As the knob 252 is engaged with the bolt 251 on the rear surface of the cable tray 100 in the state that the bolt 251 is fitted into the slot 105, the mounting of the tray clamp 180 is completed.

After the mounting of the tray clamp 180 has been
20 finished as described above, the wires 150 to be laid are inserted into the grippers 351, 353, and 353.

Hereinafter, the vertical-grip type tray clamp according an exemplary embodiment of the present invention laid on the cable tray will be described in detail.

In the state that t tray clamps 180 according to the present invention are mounted on the cable tray 100 at a predetermined height interval, the power line 150 is inserted. In addition, a cable laying robot (not shown) is
5 interposed between the tray clamps 180 of the cable tray 100 to draw the power line 150.

In other words, the cable laying robot draws the power line 150 by a predetermined length to lay the cable. Since the cable laying robot uses "a device for laying a power
10 line in a gripping type (see Korean Patent Application No. 10-2013-0114512), and 'a system for laying a cable (see Korean Patent Application No. 10-2013-0098981) filed by the applicant of the present invention, the details thereof will be omitted.

15 The power line 150 is moved up by a predetermined length through the cable laying robot. During the operation of the cable laying robot, the power line 150 is stopped to be moved up temporarily. In this case, the power line 150 is prevented from being dropped down by the grippers 351,
20 352, and 353 mounted in the mounting parts 218.

As shown in FIG. 19, the eye gripper 351 allows the power line 150 to be positioned inside the gripper and moved up by the predetermined height through the cable laying robot.

When the cable laying robots is temporarily stopped to move up the power line 150 after moving up the power line 150 by the predetermined height, the power line 150 may be sagged (dropped down) by the weight of the power line 150.

5 In this case, the eye gripper 351 is folded down to prevent the power line 150 from being sagged as shown in drawings. In other words, the power line 150 is maintained in the close contact state with the inner surface of the gripper 351, and moved up as the cable laying robot moves
10 up the power line 150.

However, if the power line 150 is sagged, the eye gripper 351 is folded down so that the power line 150 is drawn toward the tray clamp 180. Accordingly, the power line 150 is prevented from being prevented by the eye
15 gripper 351.

In other words, as the eye gripper 351 is folded down in drawings, the power line 150 makes close contact (compression) with the gripper 351 so that the power line 150 can be prevented from being sagged.

20 In addition, the belt gripper 352 has a substantially triangular shape and a belt having a predetermined length is provided rotatably in one direction. In other words, the belt gripper 352 is rotated in one direction by a one-way bearing. In this case, the power line 150 is in close
25 contact with a plurality of belts. When the power line 150

is moved up, the belt is rotated. If the power line 150 is sagged, the belt is maintained in the close contact (compression) with the power line 150 so that the power line 150 can be prevented from being sagged by compression.

5 In addition, the wedge-type gripper 353 has a substantially equivalent triangle similarly to that of the belt gripper 352, and a rotating roller or bearing is mounted rotatably in one direction at each side of the triangle.

10 In other words, the roller or the bearing of the wedge-type gripper 353 is rotated in one direction, and makes close contact with the outer surface of the power line 150 at ordinary times. Accordingly, when the power line 150 is moved up, the roller is rotated. If the power
15 line 150 is sagged in the state that the power line 150 is stopped to be moved up, the power line 150 can be prevented from being sagged.

Although the exemplary embodiments of the present invention have been described, it is understood that the
20 present invention should not be limited to these exemplary embodiments but various changes and modifications can be made by one ordinary skilled in the art within the spirit and scope of the present invention as hereinafter claimed.

The device for laying the power line can be installed
25 in a light-weight, thin, small, and compact structure at a

place, such as a cable tray of a ship, where the access of a worker is limited.

【CLAIMS】

【Claim 1】

A device for laying a power line on a wire pathway having a plurality of trays through a gripper technique,
5 the device comprising:

at least one driving unit provided on the wire pathway to form force of laying the power line through reciprocal movement of an actuator; and

a gripping unit to grip the power line and to transfer
10 the laying force to the power line in synchronization with the driving unit.

【Claim 2】

The device of claim 1, wherein the gripping unit
15 comprises one of a car-type gripper, a U-type gripper, and a bubble-type gripper.

【Claim 3】

A device for laying a power line through a gripper
20 technique by applying force of laying the power line to transfer the power line onto a preset pathway, the device comprising:

a movable body having a link movable in a forward-backward direction of the power line; and

a gripping unit comprising a gripper to grip the power line in linkage with the link.

【Claim 4】

5 The device of claim 3, wherein the gripper of the gripping unit comprises at least one of a wire rod, a belt, a U-shaped rod, and a one-way roller.

【Claim 5】

10 The device of claim 4, wherein the gripper comprises at least one of a wire rope, a chain, fiber, and resin when the gripper is the wire rod.

【Claim 6】

15 The device of claim 4, wherein the gripper further comprises at least one of a plurality of blocks, screws, and engaged concavo-convex patterns corresponding to a diameter of the power line.

【Claim 7】

20 The device of claim 3, wherein the gripping unit further comprises a locking member to attach and detach the gripper, and the locking member employs at least one of a pocket, a bracket, and a screw.

25

【Claim 8】

The device of claim 3, wherein the gripper of the gripping unit includes a cladding material formed of at least one of air hose, vinyl, leather, fiber, and rubber to prevent the power line from being damaged.

【Claim 9】

A device for laying a power line through a gripper technique by transferring the power line, the device comprising:

a base having a hinge shaft; and

a link rotatably mounted on the hinge shaft of the base and having a wire rope for coupling the power line.

【Claim 10】

The device of claim 9, wherein the wire rope of the link includes a plurality of spherical members to adjust a coupling length of the wire rope of the link.

【Claim 11】

The device of claim 9, wherein the link comprises a ball plunger to support the wire rope.

【Claim 12】

The device of claim 9, wherein the link comprises a fixing groove and a ball pocket to support the wire rope.

【Claim 13】

5 The device of claim 12, wherein the fixing groove and the ball pocket have side grooves for entering of the wire rope.

【Claim 14】

10 The device of claim 13, wherein the side groove communicating with the ball pocket has a chamfered part or a rounded part at an entrance thereof.

【Claim 15】

15 The device of claim 12, wherein the fixing groove and the ball pocket have a side groove and an L-shaped groove, respectively, for entering of the wire rope.

【Claim 16】

20 A device for laying a power line through a gripper technique, the device comprising:

 a body having a predetermined length and a predetermined width;

 a locking part protruding to one side from an upper
25 end and a lower portion of the body;

a mounting part having a gripper at an intermediate portion of the body; and

a fixing unit to fix the body to a cable tray.

5 **【Claim 17】**

The device of claim 16, wherein the locking part has a multi-stage step such that the locking part is mounted on cable trays having mutually different shapes.

10 **【Claim 18】**

The device of claim 16, wherein one of an eye gripper, a belt gripper, and a wedge-type gripper is fixed to the mounting part.

15 **【Claim 19】**

The device of claim 16, wherein the body is formed therein with a rectangular hole to vary a fixing position of the fixing unit and with a cover to cover the rectangular hole.

20

【Claim 20】

The device of claim 19, wherein the fixing unit comprises: a bolt movably fixed into the rectangular hole of the body; and a knob coupled to a rear surface of the
25 body by the bolt.