

【DESCRIPTION】

【Invention Title】

SYSTEM FOR CONTROLLING POWER LINE-LAYING ROBOTS

【Technical Field】

5 The present invention relates to a system for
controlling power line-laying robots, and more particularly,
to a system for controlling power line-laying robots, which
controls a plurality of power line-laying robots that help
lay power lines in a large-scale vessel and a marine
10 construction site.

【Background Art】

It is difficult to lay power lines because much labor
is necessary for laying power lines due to frictional
resistances between trays and cables.

15 For example, when a ship is dried, support objects such
as various cables or tubes and power lines are laid for
supplying electric power and connecting devices. The power
lines are installed in a multi-stage cable tray and are
fixed to the ship, and the kinds and sizes of the power
20 lines are various, and in some cases, one million meters of
power lines are laid.

The electric power laying operation requires a number
of work persons, and productivity lowers because the work
condition is very bad due to narrow work spaces and high
25 and deep trays and musculoskeletal system disorders of the

work persons are rapidly increasing because much man power is required in laying power lines.

In order to solve the problem, a power line-laying robot is used for a power line laying operation.

5 In laying cables, a cable wound on a cable drum is released while being pushed by a caterpillar and is laid while being pulled on an opposite side by a winch. Further, a method of helping feed a cable by installing a feeding type cable laying apparatus at a start end and an intermediate end of the cable.

10 That is, for example, as illustrated in FIG. 1, an operator directly enters a vertical space 6 through a manhole to lay an electric power cable 10 through a pipe 7, and a caterpillar 2 and a cable drum 3 are installed and a controller 1 for controlling the operation is installed in consideration of a radius of curvature of the electric power cable that is to be laid first and a bent portion in the vertical space 6. Thereafter, a pulling rope 5 in the pipe 7 and an electric power cable 10 are connected to each other by using a pulling eye 4, and the electric power cable 10 is laid.

An example of such technologies is disclosed in the following documents and the like.

For example, Korean Patent Application Publication No. 25 2011-0097172 (published on August 31, 2011) relates to a

cable extracting apparatus, and discloses a technology of rotating support rollers that support a lower side of a drum positioned on the upper side of the support rollers to easily extract a cable wound and laid on the drum as the drum is rotated, and extracting three or more cables provided on one or opposite sides of a support and wound and laid on the drum by an auxiliary support.

Further, Korean Utility Model No. 20-0263315 (registered on January 23, 2002) discloses a laying guide roller in which in order to lay a power transmission/distribution cable in an underground power tunnel, a cable wound on a large-scale ground hub is supplied into a power tunnel by a scaffolding, the cable in the power tunnel is fed along a guide roller while being extracted by a plurality of fixed caterpillars, the cable is mounted on the fixed caterpillar while being seated on the guide roller, the cable is fed along the guide roller through pulling of the plurality of caterpillars, and the fed cable is laid on a hanger installed on a wall of the power tunnel.

【Disclosure】

【Technical Problem】

However, according to the related art, because the power line-laying robots are operated individually and the lower line laying speeds of the power line-laying robots

are set to be constant, the entire power line laying operation should be stopped when any one of the power line-laying robots has a disorder during a power line-laying operation.

5 Further, according to the related art, in the case of power line-laying robots to which a pneumatic pressure is applied, because pneumatic pressure lines should be constructed in the pneumatic pressure supply hoses in the power line-laying robots, installation time increases, the
10 hoses may be damaged as the plurality of pneumatic pressure lines are twisted.

The present invention has been made in an effort to solve the above-mentioned problems, and provides a system for controlling power line-laying robots, which can solve a
15 disorder generation problem of a plurality of power line-laying robots by controlling the plurality of power line-laying robots such that the plurality of power line-laying robots interwork each other.

Another object of the present invention is to provide a
20 system for controlling power line-laying robots, which can control a plurality of power line-laying robots with one control board.

Another object of the present invention is to provide a system for controlling power line-laying robots, which can
25 control the speeds, the repetition periods, and the

operation modes of the plurality of power line-laying robots.

【Technical Solution】

In order to achieve the object, there is provided a
5 system for controlling power line-laying robots, the system
including: a plurality of power line-laying robots driven
by a pneumatic pressure and mounted on a cable tray to lay
cables, a control board that controls driving of the
plurality of power line-laying robots such that the
10 plurality of power line-laying robots interwork with each
other, a pneumatic pressure supply unit that supplies a
pneumatic pressure to the plurality of power line-laying
robots, and a plurality of pneumatic pressure lines
connected between the plurality of power line-laying robots
15 and the pneumatic pressure supply unit to supply a driving
source for driving and controlling the power line-laying
robots, wherein the pneumatic pressure lines are connected
to each other by a complex coupler, and wherein each of the
pneumatic pressure lines includes a hose for supplying and
20 discharging air for driving the corresponding power line-
laying robot, and an electric power line provided in the
hose to supply electric power for controlling the power
line-laying robot.

In the system for controlling power line-laying robots,
25 each of the pneumatic pressure lines includes a first

pneumatic pressure line connected to the pressure supply unit and the control board, and a second pneumatic pressure line connected to the control board and the corresponding power line-laying robot.

5 In the system for controlling power line-laying robots, the control board includes a control part that controls the corresponding power line-laying robot, and a speed adjusting part that controls the repetition period speed of the corresponding power line-laying robot.

10 In the system for controlling power line-laying robots, the control board further includes a continuous mode part that drives the corresponding power line-laying robot such that the plurality of power line-laying robots are moved forwards and rearwards in opposite directions.

15 In the system for controlling power line-laying robots, the control board further includes a synchronization mode part that performs a control to drive the corresponding power line-laying robot such that the plurality of power line-laying robots are moved forwards and rearwards in the
20 same direction.

 In the system for controlling power line-laying robots, the second pneumatic pressure line is connected between two power line-laying robots.

 In the system for controlling power line-laying robots,
25 each of the power line-laying robots includes a pneumatic

circuit, and the control board controls the pneumatic circuit to control the speed and repetition period of the power line-laying robot.

In the system for controlling power line-laying robots,
5 the complex coupler includes a female coupler and a male coupler, each of the female coupler and the male coupler includes a coupling terminal coupled to the hose, an insulation member provided for the coupling terminal, and an electric power line provided on the insulation member,
10 and the hose and the electric power line are connected to each other through coupling of the female coupler and the male coupler.

In the system for controlling power line-laying robots, the control board includes an antenna for wirelessly
15 controlling the power line-laying robot, a switch that switches on and off an operation of the power line-laying robot, a speed adjusting part that controls the speed of the power line-laying robot, and a display unit that displays the repetition period of the power line-laying
20 robot.

In the system for controlling power line-laying robots, the power line-laying robot includes a controller, the controller includes a pulse generator, a solenoid valve, and a wireless module, and the repetition period of the
25 power line-laying robot is controlled by adjusting the

pulse width of the solenoid according to a command from the speed adjusting part.

In the system for controlling power line-laying robots, the power line-laying robot is controlled in a wired manner, and a control line for controlling the power line-laying robot is provided in the pneumatic pressure line.

In the system for controlling power line-laying robots, the complex coupler further includes a fixing member that fixes the hose, the coupling terminal, and the electric power line.

In the system for controlling power line-laying robots, the system further includes: a central controller connected to a plurality of control boards to individually control the control boards.

In the system for controlling power line-laying robots, each of the power line-laying robots includes a gripper including a body including a base and a link that are movable in a forward/rearward direction of the cable, and a gripper body that grips the cable in association with the link.

【Advantageous Effects】

As described above, according to the system for controlling power line-laying robots according to the present invention, because the control board is coupled to the pneumatic hoses for supplying pneumatic pressure and

the plurality of power line-laying robots are coupled to the control board, an installation time for supplying a pneumatic pressure in the field can be reduced and management costs of the power line-laying robots can be reduced.

Further, according to the system for controlling power line-laying robots according to the present invention, because the plurality of power line laying bots can be controlled by one control board, management costs of the power line-laying robots can be reduced.

Further, according to the system for controlling power line-laying robots according to the present invention, because the plurality of power line-laying robots are controlled such that the plurality of power line-laying robots interwork with each other in correspondence to the laying of the power lines that requires various construction methods and applications according to sections and forms for laying power lines.

According to the system for controlling power line-laying robots according to the present invention, because the electric power lines are provided in the hoses for supplying pneumatic pressure, a disorder due to the hoses and the electric power lines can be prevented in the field.

【Description of Drawings】

FIG. 1 is a view illustrating a process of laying power

lines according to the related art,

FIG. 2 is a diagram of a system for controlling power line-laying robots according to a first embodiment of the present invention,

5 FIG. 3 is a view illustrating an example of a configuration of a control board illustrated in FIG. 2,

FIG. 4 is a view illustrating another example of a configuration of a control board illustrated in FIG. 2,

10 FIG. 5 is a view illustrating a coupled state in the system for controlling power line-laying robots illustrated in FIG. 2;

FIG. 6 is a diagram of a system for controlling power line-laying robots according to a second embodiment of the present invention,

15 FIG. 7 is a diagram of a system for controlling power line-laying robots according to a third embodiment of the present invention,

FIG. 8 is a diagram of a control board illustrated in FIG. 7,

20 FIG. 9 is a view illustrating a configuration of a power line-laying robot illustrated in FIG. 7,

FIG. 10 is a view illustrating a structure of a complex coupler to describe coupling of a pneumatic pressure line illustrated in FIG. 7,

25 FIG. 11 is a view illustrating another example of a

complex coupler illustrated in FIG. 10,

FIG. 12 is a wiring view of a system for controlling power line-laying robots applied to the first embodiment or the second embodiment of the present invention, and

5 FIG. 13 is a view illustrating an example of a structure of a power line-laying robot applied to the present invention.

 【Best Mode】

 【Mode for Invention】

10 The above and other unmentioned objects and new features of the present invention will become clearer with reference to the techniques and of the specification and the accompanying drawings.

 Hereinafter, a configuration of the present invention
15 will be described with reference to the accompanying drawings.

 [First Embodiment]

 FIG. 2 is a diagram of a system for controlling power line-laying robots according to a first embodiment of the present invention, and FIG. 3 is a view illustrating an
20 example of a configuration of a control board illustrated in FIG. 2.

 As illustrated in FIG. 2, the system for controlling power line-laying robots according to the first embodiment
25 of the present invention includes a plurality of power

line-laying robots 10 driven by a pneumatic pressure and mounted on a cable tray to lay cables, a pneumatic pressure supply unit (not illustrate) that supplies a pneumatic pressure to the plurality of power line-laying robots 10, a
5 plurality of pneumatic pressure lines 20 connected between the plurality of power line-laying robots 10 and the pneumatic pressure supply unit, and a control board 30 that controls driving of the plurality of power line-laying robots 10 to interwork with the plurality of power line-laying robots 10.
10

The pneumatic pressure lines 20 are connected to each other by a complex coupler, and may include a first pneumatic pressure line 21 connected to the pressure supply unit and the control board 30, and second pneumatic
15 pressure lines 22 connected to the control board 30 and the plurality of power line-laying robots 10.

Further, the pneumatic pressure line 20 includes hoses for supplying or discharging air for driving the power line-laying robots 10, and electric power lines provided in
20 the hoses to supply electric power for controlling the power line-laying robots. Further, although it has been described in the first embodiment that the pneumatic pressure lines 20 are provided with hoses, the present invention is not limited thereto but the hoses may be
25 replaced by pipes or the like.

The power line-laying robots 10 are driven by a pneumatic pressure, and the example of FIG. 2 illustrates a structure in which two power line-laying robots 10 are controlled by the control board 30 to interwork with each other. However, the number of the power line-laying robots 10 controlled by the control board 30 is not limited to 2 and may be changed according to a setting condition.

The pneumatic pressure ensures an excellent field maintenance performance as compared with electricity, and even though an overload, by which a cable does not move due to a temporary disagreement in synchronous driving between a plurality of pieces of equipment, is applied, a malfunction phenomenon that is similar to an overload of an electric motor can be excluded. Rather, the pneumatic pressure is advantageous for automatic synchronization because an operation can be delayed to a state in which an automatic synchronization is made, that is, a state in which maximum pressures are applied for respective actuators.

As illustrated in FIG. 3, the control board 30 is provided with a control part 31 that controls the plurality of power line-laying robots 10, and a speed adjusting part 32 that adjusts the repetition period speeds of the plurality of power line-laying robots 10.

The control part 31 and the speed adjusting part 32 are

two levers provided on the control board 30, and the control part 31 may select a start, a stop, and a reset of the power line-laying robots 10 and the speed adjusting part 32 adjusts a repetition period speed of the power line-laying robots 10.

The speeds are adjusted, for example, by adjusting a pneumatic circuit provided in the power line-laying robots 10.

Next, another example of the system for controlling the power line-laying robots according to the present invention will be described with reference to FIG. 4.

FIG. 4 is a view illustrating another example of the configuration of the control board illustrated in FIG. 2.

As illustrated in FIG. 4, the control board 30 is provided with a control part 31 that manipulates a plurality of power line-laying robots 10 that correspond to the configurations illustrated in FIG. 3, a synchronization mode part 33 that performs a control to drive the plurality of power line-laying robots 10 forwards or rearwards in the same way in addition to a speed adjusting part 32 that adjusts repetition period speeds of the plurality of power line-laying robots 10, and a continuous mode part 34 that drives the plurality of power line-laying robots 10 forwards or rearwards in different ways.

Accordingly, the plurality of power line-laying robots

may be classified into a first power line-laying robot and a second power line-laying robot so that the operation driving manners of the first power line-laying robot and the second power-line-laying robot may be controlled in two modes. That is, when the plurality of power line-laying robots are controlled by the synchronization mode part 33, the first power line-laying robot and the second power line-laying robot are operated forwards or rearwards in the same way. In contrast, when they are controlled by the continuous mode part 34, the first power line-laying robot and the second power line-laying robot are operated in opposite ways. For example, if the first power line-laying robot is moved forwards, the second power line-laying robot is moved rearwards, so that they are operated in opposite ways. Accordingly, the cables may be continuously laid.

Further, in a robot laying section in which it is necessary to install a large number of robots, as illustrated in FIG. 2, mutual states of the power line-laying robots, for example, speeds, management of a synchronous mode, and management of a continuous mode can be identified in the power line-laying line of all sections by using communication devices between equipment operators while the power line-laying robots are installed.

As described above, by allowing the operator to control the two power line-laying robots 10 such that the power

line-laying robots 10 interwork with each other as illustrated in FIG. 2, when any one of the two power line-laying robots 10 has a disorder, for example, the first power line-laying robot has a disorder in executing laying of power lines, the disorder of the first power line-laying robot can be solved by allowing the second power line-laying robot to lay power lines reversely.

Further, for example, when the first power line-laying robot has a disorder, the power lines can be maintained at a constant speed in all sections by operating the first power line-laying robot in a free run state and increasing the speed of the second power line-laying robot.

Further, although FIG. 4 illustrates a structure in which the control part 31, the speed adjusting part 32, the synchronization mode part 33, and the continuous mode part 34 are all equipped, the control part 31, the speed adjusting part 32, and the synchronization mode part 33 may be provided to be used or the control part 31, the speed adjusting part 32, and the continuous mode part 34 may be provided to be used according to the power line laying section, the kind of the power lines, or the like.

Next, a structure of connecting a plurality of power line-laying robots to the above-mentioned control board 30 to operate the plurality of power line-laying robots will be described with reference to FIG. 5.

FIG. 5 is a view illustrating a coupled state in the system for controlling power line-laying robots illustrated in FIG. 2.

As illustrated in FIG. 5, in the system for controlling
5 power line-laying robots according to the present invention, the plurality of power line-laying robots may be sequentially connected to the control board 30 to be used.

For example, a first pneumatic pressure line 21 connecting the pneumatic pressure supply unit and the
10 control board 30 is maintained at a distance of 3 m to 5 m, and a second pneumatic pressure supply line 22 connecting the control board 30 and the power line-laying robot 10 is maintained at a distance of 2 m to 4 m.

T-shaped couplers are provided for the first pneumatic
15 pressure line 21 and the second pneumatic pressure line 22, respectively, so that the supply lines of pneumatic pressure can be easily realized.

Unlike the structure illustrated in FIG. 2, in the structure illustrated in FIG. 5, the second pneumatic
20 pressure line 22 is sequentially connected between the power line-laying robot 10 and the power line-laying robot 10. Further, the connection between the power line-laying robot 10 and the power line-laying robot 10 may be executed by a T-shaped coupler.

25 A plurality of power line-laying robots 10 can be

controlled by one control board 30 by applying the structure illustrated in FIG. 5.

[Second embodiment]

Next, the second embodiment of the present invention
5 will be described with reference to FIG. 6.

FIG. 6 is a diagram of a system for controlling power line-laying robots according to a second embodiment of the present invention.

The embodiment illustrated in FIG. 6 relates to a
10 structure in which the plurality of power line-laying robots 10 are controlled in a wired manner.

That is, control lines 222 for controlling the power line-laying robots 10, respectively, are controlled in the pneumatic lines 20, and each of the plurality of power
15 line-laying robots 10 includes a pneumatic cylinder and a pneumatic circuit.

That is, the pneumatic pressure line 20 is provided with a pneumatic pressure supply line 210, an electric power line 221, and a control line 222, the pneumatic
20 pressure supply line 210 is connected to the power line-laying robot 10 separately from coupling lines 220 of the electric power line 221 and the control line 222, and the control board 30 controls the pneumatic circuit to control the speed and repetition period of the power line-laying
25 robot 10.

Reference 130 of FIG. 6 illustrates a gripper that grips a power line to move the power line. The gripper 130 may be any one of a car type gripper, a U type gripper, and a balloon type gripper.

5 The car type gripper interrupts movement of a cable through rotation of an arm, the U type gripper interrupts movement of a cable through elevation of a U-shaped band, and the balloon type gripper interrupts movement of a cable by expanding and contracting a band with a pneumatic
10 pressure. The car type gripper, the U type gripper, and the balloon type gripper may be made small-sized, and may be easily installed in a tray of a narrow ship.

[Third Embodiment]

FIG. 7 is a diagram of a system for controlling power
15 line-laying robots according to a third embodiment of the present invention, FIG. 8 is a diagram of a control board illustrated in FIG. 7, FIG. 9 is a view illustrating a configuration of a power line-laying robot illustrated in FIG. 7, and FIG. 10 is a view illustrating a structure of a
20 complex coupler to describe coupling of a pneumatic pressure line illustrated in FIG. 7.

As illustrated in FIGS. 7 and 8, in the system for controlling power line-laying robots according to the third embodiment of the present invention, a plurality of power
25 line-laying robots 10 that are mounted to a cable tray 1 to

lay cables 2 are connected to pneumatic pressure lines 20, respectively, and a control board 30 that controls the power line-laying robots 10 such that the power line-laying robots 10 interwork with each other wirelessly controls the plurality of power line-laying robots 10.

That is, as illustrated in FIG. 8, the control board 30 includes an antenna for wirelessly controlling the plurality of power line-laying robots 10, an E-STOP part 410, a switch 420 for switching on and off operations of the plurality of power line-laying robots 10, a speed adjusting part for controlling the speeds of the plurality of power line-laying robots 10, and a display part 430 that displays repetition periods of the plurality of power line-laying robots 10. As illustrated in FIG. 3, the display part 430 is provided with an LED bar to allow the operator to recognize speed states of the power line-laying robots 10.

Further, as illustrated in FIG. 9, each of the power line-laying robots 10 includes a robot body 110 and a controller 120 for controlling the robot body 110.

The controller 120 includes a pulse generator 121, a solenoid valve 122, and wireless module 123.

Accordingly, the repetition period of the robot body 110 is controlled by adjusting the pulse width applied to a solenoid valve 122 according to a command transmitted from

the speed adjusting unit to the wireless module 123 through the antenna of the control board 30.

5 The adjusting of the speed corresponds to adjusting the reciprocal repetition period of the pneumatic cylinder provided in the robot body 110, and the pulse width of the solenoid of the controller 120 is adjusted. That is, the control board 30 transmits a pulse width value and generates a pulse width received from the pulse generator 121 to adjust speed and repetition period by driving the
10 solenoid valve 122.

As described above, as illustrated in FIG. 7, by controlling three power line-laying robots 10 such that the power line-laying robots 10 interwork with each other, when any one of the three power line-laying robots 10 has a
15 disorder, for example, when the second power line-laying robot 10 has a disorder in laying cables, the disorder of the second power line-laying robot 10 can be solved by allowing the third power line-laying robot 10 to lay cables reversely.

20 Further, for example, when the first power line-laying robot 10 has a disorder, the cables may be laid at a constant speed by providing the first power line-laying robot 10 in a free run state and increasing the speeds of the second and third power line-laying robots 10.

25 As illustrated in FIG. 10, the complex coupler 300

includes a female coupler 301 and a male coupler 320.

The female coupler 310 and the male coupler 320 include coupling terminals 311 and 321 coupled to a hose 312, an insulation member 314 provided on the coupling terminals 311 and 321, and an electric power line 313 provided on the insulation member 314. That is, it is preferable that the coupling terminals 311 and 321 be formed of a metal material to increase coupling force. Although the insulation member 314 is provided due to the electrical conductivity of the coupling terminals 311 and 321 when the coupling terminals 311 and 321 are formed of a metal material, the insulating member 314 may be omitted when the coupling terminals 311 and 321 are formed of a material such as reinforced plastics.

Through coupling of the female coupler 310 and the male coupler 320 having the above-mentioned structure, the hose 312 and the electric power line 313 are connected to each other.

Because the electric power line 313 is provided in the hose 312 as described above according to the present invention, it is not necessary to provide a separate power line for controlling the power line-laying robots unlike the related art. Accordingly, a power line laying field can be put in order and a problems caused by tangling of the hose 312 and the electric power line 313 can be solved.

Further, the length of the pneumatic pressure line 20 can be easily extended by inserting the male coupler 320 into the female coupler 310.

Further, as illustrated in FIG. 11, the complex coupler 5 300 may be provided with a fixing member 330 that fixes the hose 312, the coupling terminals 311 and 321, and the electric power line 313. Because the fixing member 330 provides a function of fastening the hose 312 and the electric power line 313 towards the coupling terminals 311 and 321, for example, by providing a structure such as a 10 fixing ring, the hose 312 and the electric power line 313 can be prevented from being separated from the coupling terminals 311 and 321.

Next, a coupling state of the power line-laying robots 15 110, the control board 30, and the controller 120 will be described with reference to FIG. 12.

FIG. 12 is a wiring view of the system for controlling power line-laying robots applied to the first or second embodiment of the present invention.

20 Although FIG. 12 illustrates wired coupling for description of a circuit, the present invention is not limited thereto but wireless connections may be applied to the third embodiment of the present invention.

As illustrated in FIG. 12, the controller 120 connected 25 to the power line-laying robots 110 and the control board

30 controls an operation timing with a time delay valve 45 implemented by a solenoid valve. The controller 120 may be preferably a pneumatic reciprocally driven actuator, but may be a hydraulic cylinder, an electrical type, an engine type, or the like.

In the operation of the actuator, the time delay valve 45 sets a difference between a start time point and a stop time point of equipment including the robot bodies 110 and the controller 120, for example, by allowing the operator to manipulate a start lever, a stop lever, and a reset lever of the control part 31 provided in the control board 30.

Meanwhile, the cables 1 may be automatically moved during a reciprocal movement thereof by attaching the robot body 10 to the actuator of the controller 120. Of course, the actuator may be applied to all actuators performing reciprocal movements as well as a pneumatic actuator. When a resistance in the progress direction of the cable 1 is small, a roller (not illustrated) may replace the robot body 110.

Further, according to the present invention, the power line-laying robot 10 and the controller 120 may be individually controlled by the control board 30 and a central controller.

The central controller is connected to a plurality of

control boards 30 at a location where a control can be conveniently performed. The process logics of the present invention are performed by a plurality of control boards 30 to improve operation speed and reliability, and to minimize a danger burden when an error is generated. The central controller has a function of processing information of an external device, in addition to a function of managing the plurality of control boards 30. Further, a wireless manipulator may be interposed between the control board 30 and the central controller.

Next, the structure of the robot body 110 applied to the present invention will be described with reference to FIG. 13.

FIG. 13 is a view illustrating an example of a structure of a robot body applied to the present invention.

As illustrated in FIG. 13, the mechanical configuration of the robot body applied to the present invention includes a gripper 130, a body 140, and a controller 120.

The body 140 according to the present invention includes a base and a link 142 that may be moved in a forward/rearward direction of the cable 1. The body 140 is based on a frame that is to be fixed to a cable tray 2, and the link 142 is accommodated on the frame to be moved forwards and rearwards. Because the forward/rearward direction is a direction in which the cable 1 is laid, it

includes all of horizontal, vertical, and curved directions that are paths of the cable tray 2. The forward/rearward movement of the link 142 is not limited to linear motions but includes rotations.

5 The link 142 of the body 140 is moved together with the cable 1 only during a one-way movement thereof. The link 142 may be moved together with a power line by an operation of a frictional force during a forward movement thereof, and may be moved rearwards separately from a power line
10 during a rearward movement thereof. Of course, when the body 140 is rotated in an opposite direction and is attached to the controller 120, a power line may be moved rearwards by applying a frictional force to the cable 1 during a rearward movement thereof, and may be moved
15 separately from the cable 1 during a forward movement thereof. It is a principle in which a frictional force is applied to the cable 1, for example, only when the link 142 is moved forwards while the link 142 is repeatedly moved forwards and rearwards on the body 140. The one-way laying
20 force is applied by a simple mechanical mechanism, an overall configuration thereof is simplified.

 The hinge shaft 143 for connection of the body 140 and the link 142 is installed to be separated, by interposing at least one of a split pin, a snap ring, a screw, and a
25 key. The link 142 is installed to be rotated (fluctuated)

by interposing the hinge shaft 143 on the body 140. For convenience of use and maintenance, it is preferable that the link 142 is easily separated. For this, the hinge shaft 143 is coupled to to be easily separated by a split pin, a snap ring, a screw, or a key.

A stopper 145 is interposed between the body 140 and the link 22 to restrict a forward/rearward motion range. As an example of the stopper 145, a convexo-concave structure may be applied between the body 140 and the link 142. The stopper 145 preferably is a concealed structure, but may be a structure that is exposed to the outside. Of course, the stopper 145 may be set to a maximum allowable motion range instead of a substantial motion range.

Further, the gripper 130 according to the present invention has a gripper body 131 such that the gripper body 131 grips a cable 1 in association with the link 142. The gripper body 31 interrupts a laying force for the cable 1 together with the above-described link 142. It is general that one gripper body 131 is applied to one link 142, but a plurality of gripper bodies 131 may be applied to one link 142.

The gripper body 131 of the gripper 130 employs at least one of a wire, a belt, a U-shaped rod, and a one-way roller. The wire is a flexibly bendable member, and is advantageous in detachment (loading/unloading) of the cable

1. The belt has flexibility like the wire, and has a relatively large width and may have a convexo-concave portion on an inner surface thereof according to occasions. The U-shaped rod may improve durability with a high strength while it is inconvenient to attach and detach the cable 1. The one-way roller has a structure in which a roller and a one-way clutch are coupled to each other, and is disadvantageous in light weight, slimness, short length, and small size, but may minimize a frictional force during a rearward motion thereof. The rod, belt, U-shaped rod, and one-way roller of the gripper body 131 may be used alone or in an integrated way.

Then, the gripper body 131 is a wire, at least one of a wire rope, a chain, a fiber, and a resin may be used. A steel material is preferred as the wire rope, but a fiber or a resin may be included. The chain is disadvantageous in light weight, slimness, short length, and small size, but may be partially replaced when it is cut off. The fiber and the resin may be used in a single core or concentric form having a high strength.

Meanwhile, the gripper body 131 may preferably further include at least one of a plurality of blocks, a screw thread, and an engaging convexo-concave structure to correspond to the diameter of the cable 1. When a configuration for adjusting length is provided for the

gripper body 131, it may be directly used even though the diameter of the cable 1 is changed. The block preferably has a spherical shape, a polyhedral shape, a conical shape, or the like, but may be at least partially replaced by a
5 nut that is a standard product. In any case, an aperture of the block is coupled to a predetermined section of the wire and is widened at a desired point to be coupled to the link 142. In addition, the length of the gripper body 131 may be adjusted by coupling a thread to some areas of the block,
10 engaging a convexo-concave portion to the block, and pressing one side of the block with a screw.

The gripper 130 further includes a locker 135 for attaching and detaching the gripper body 31, and the locker 135 employs at least one of a pocket, a bracket, and a
15 screw. One end of the gripper body 31 is firmly fixed to the link 142, and an opposite end thereof is fixed to the locker 135 to be released. When a wire is used as the gripper body 31 and a plurality of blocks are coupled to the wire, a pocket that may be engaged with the blocks is
20 formed in the link 142. With the same principle, a bracket or a screw may be used as the locker 135 according to the gripper body 131 and a length adjusting method thereof.

The gripper body 31 further includes a covering member formed of at least one of an air hose, vinyl, leather,
25 fiber, and rubber to prevent damage to the cable 1. If a

pressing force of the gripper body 131 coupled to the link 142 is applied to the cable 1, the cover of the cable 1 may be damaged by a high load. In order to prevent this, a covering member 133 having an anti-wear property while
5 having a high frictional coefficient is added on an outer surface of the gripper body 31. The covering member 133 is formed of at least one of an air hose, vinyl, leather, fiber, and rubber. Of course, when the damage to the cable 1 is not considered, the covering member 133 may not be
10 used.

Although the present invention made by the present inventor has been described with reference to the embodiments of the present invention, the present invention is not limited to the embodiment but it is apparent that
15 the present invention may be variously modified without departing from the essence of the present invention.

Industrial Applicability

Because a plurality of power line-laying robots can be controlled to interwork with each other by using the system
20 for controlling power line-laying robots according to the present invention, a disorder of a power line-laying robot can be prevented.

【CLAIMS】

【Claim 1】

A system for controlling power line-laying robots, the system comprising:

5 a plurality of power line-laying robots driven by a pneumatic pressure and mounted on a cable tray to lay cables,

10 a control board that controls driving of the plurality of power line-laying robots such that the plurality of power line-laying robots interwork with each other,

 a pneumatic pressure supply unit that supplies a pneumatic pressure to the plurality of power line-laying robots, and

15 a plurality of pneumatic pressure lines connected between the plurality of power line-laying robots and the pneumatic pressure supply unit to supply a driving source for driving and controlling the power line-laying robots,

 wherein the pneumatic pressure lines are connected to each other by a complex coupler, and

20 wherein each of the pneumatic pressure lines comprises a hose for supplying and discharging air for driving the corresponding power line-laying robot, and an electric power line provided in the hose to supply electric power for controlling the power line-laying robot.

25 **【Claim 2】**

The system of claim 1, wherein each of the pneumatic pressure lines comprises a first pneumatic pressure line connected to the pressure supply unit and the control board, and a second pneumatic pressure line connected to the control board and the corresponding power line-laying robot.

【Claim 3】

The system of claim 2, wherein the control board comprises a control part that controls the corresponding power line-laying robot, and a speed adjusting part that controls the repetition period speed of the corresponding power line-laying robot.

【Claim 4】

The system of claim 3, wherein the control board further comprises a continuous mode part that drives the corresponding power line-laying robot such that the plurality of power line-laying robots are moved forwards and rearwards in opposite directions.

【Claim 5】

The system of claim 3 or 4, wherein the control board further comprises a synchronization mode part that performs a control to drive the corresponding power line-laying robot such that the plurality of power line-laying robots are moved forwards and rearwards in the same direction.

【Claim 6】

The system of claim 5, wherein the second pneumatic

pressure line is connected between two power line-laying robots.

【Claim 7】

The system of claim 1, wherein each of the power line-laying robots comprises a pneumatic circuit, and the control board controls the pneumatic circuit to control the speed and repetition period of the power line-laying robot.

【Claim 8】

The system of claim 1, wherein the complex coupler comprises a female coupler and a male coupler, each of the female coupler and the male coupler comprises a coupling terminal coupled to the hose, an insulation member provided for the coupling terminal, and an electric power line provided on the insulation member, and the hose and the electric power line are connected to each other through coupling of the female coupler and the male coupler.

【Claim 9】

The system of claim 8, wherein the control board comprises an antenna for wirelessly controlling the power line-laying robot, a switch that switches on and off an operation of the power line-laying robot, a speed adjusting part that controls the speed of the power line-laying robot, and a display unit that displays the repetition period of the power line-laying robot.

【Claim 10】

The system of claim 9, wherein the power line-laying robot comprises a controller, the controller comprises a pulse generator, a solenoid valve, and a wireless module, and the repetition period of the power line-laying robot is controlled by adjusting the pulse width of the solenoid according to a command from the speed adjusting part.

【Claim 11】

The system of claim 1, wherein the power line-laying robot is controlled in a wired manner, and a control line for controlling the power line-laying robot is provided in the pneumatic pressure line.

【Claim 12】

The system of claim 8, wherein the complex coupler further comprises a fixing member that fixes the hose, the coupling terminal, and the electric power line.

【Claim 13】

The system of claim 1, further comprising:

a central controller connected to a plurality of control boards to individually control the control boards.

【Claim 14】

The system of claim 1, wherein each of the power line-laying robots comprises a gripper comprising a body comprising a base and a link that are movable in a forward/rearward direction of the cable, and a gripper body that grips the cable in association with the link.