【CLAIMS】

【Claim 1】

A pneumatic device for power line-laying robots, comprising:

a control unit that reciprocates a power line-laying robot,

wherein the control unit comprises:

an initiation valve that initiates supply of air having a predetermined pressure;

a main valve that selectively supplies and exhausts air to and from a pneumatic cylinder according to an operation of the initiation valve;

a control valve that adjusts the exhaustion time of the air exhausted from the main valve to control an operation of the main valve;

a pneumatic cylinder that reciprocates according to the operation of the main valve;

a plurality of gripping units disposed on a cable tray at a predetermined interval; and

a driving unit that pulls the power line with the reciprocation of the actuator to be synchronized with the plurality of gripping units installed on the cable tray, wherein the control unit controls the gripping units with unit controllers and a central controller, respectively, and the driving unit adjusts an operation timing between actuators with a switch, a control valve, and a time delay valve.

【Claim 2】

The pneumatic device of claim 1, wherein the control valve comprises:

a first control valve that controls a flow amount of the air exhausted from the main valve; and

a second control valve that controls a flow amount of the air exhausted from the first control valve.

【Claim 3】

The pneumatic device of claim 2, wherein the first control valve comprises:

a check valve that interrupts a passage by the air exhausted from the main valve; and

a flow amount control valve that is connected to the check valve in parallel and passes the air to the second control valve.

【Claim 4】

The pneumatic device of claim 2, wherein the second control valve is operated by the first control valve, and

the second control valve comprises a flow amount control valve that controls a flow amount of the air exhausted through an exhaust port.

【Claim 5】

The pneumatic device of claim 1, further comprising:

a rapid exhaustion valve that is connected to the main valve and rapidly exhausts the air filled in the pneumatic cylinder.

【Claim 6】

The pneumatic device of claim 5, wherein the control valve comprises:

a first control valve that controls a flow amount of the air exhausted from the main valve; and

a second control valve that controls a flow amount of the air exhausted from the first control valve.

【Claim 7】

The pneumatic device of claim 6, the first control valve comprises:

a check valve that interrupts a passage by the air exhausted from the main valve; and

a flow amount control valve that is connected to the check valve in parallel and passes the air to the second control valve.

【Claim 8】

The pneumatic device of claim 6, wherein the second control valve is operated by the first control valve, and

the second control valve comprises a flow amount control valve that controls a flow amount of the air exhausted through an exhaust port.

【Claim 9】

The pneumatic device of claim 1, further comprising:

a time delay valve that delays the air exhausted from the main valve for a predetermined time period to control an operation of the main valve.

【Claim 10】

The pneumatic device of claim 9, wherein the main valve comprises:

an exhaust flow amount control valve that adjusts exhaust flow amounts of the air supplied to the port and an exhaust port.

【Claim 11】

The pneumatic device of claim 9, wherein the time delay valve controls a flow amount of the air exhausted from the main valve, and comprises a direction control valve that operates the main valve with the control valve.

【Claim 12】

The pneumatic device of claim 11, wherein the control valve comprises:

a check valve that interrupts a passage by the air exhausted from the main valve;

a flow amount control valve that is connected to the check valve in parallel to pass the air to the direction control valve;

and

an air tank in which a predetermined of air exhausted from the flow amount control valve is stored.

【Claim 13】

The pneumatic device of claim 1, wherein the driving unit comprises:

a casing that guides forward and rearward feeding of the gripping unit;

a front finishing block that is inserted into a front side of the interior of the casing to close a front side of the casing;

an extendable tube installed on the front side of the interior of the casing to feed a feeding head rearwards;

a feeding head that is installed in the interior of the casing to be moved forwards and rearwards and is connected to a rear side of the extendable tube;

a rear finishing block that is inserted into the rear side of the interior of the casing to close the rear side of the casing;

a feeding guide that is installed on the front side of the rear finishing block to guide forward and rearward feeding of the feeding head; and

a return spring that is installed between the feeding head and the rear finishing block to move the feeding head and the gripping unit connected thereto forwards.

【Claim 14】

The pneumatic device of claim 13, wherein a guide groove for connection and guide of feeding of the gripping unit is formed at an upper end of the casing.

【Claim 15】

The pneumatic device of claim 13, wherein a pneumatic passage connected to the extendable tube is provided on one side of the front finishing block.

【Claim 16】

The pneumatic device of claim 13, wherein the feeding guide has a rod shape or a pipe shape, and passes through a central portion of the feeding head.

【Claim 17】

The pneumatic device of claim 13, wherein the gripping unit comprises:

a gripping ring that has a diameter larger than that of the power line; and

a connection hinge that is provided at a lower end of the gripping ring to rotatably support the gripping ring forwards and rearwards.

【Claim 18】

The pneumatic device of claim 13, wherein the control unit comprises:

a pneumatic actuator that is connected to the driving unit to supply a pneumatic pressure to the driving unit according to a control signal of a controller;

a controller that controls an operation of the pneumatic actuator according to various switch input signals;

a rearward movement detecting switch that detects a maximum rearward movement of the gripping unit to stop an operation of the pneumatic actuator;

a forward movement detecting switch that detects a maximum forward movement of the gripping unit to operate the pneumatic actuator again;

an operating switch that is connected to the controller to transmits an initial operation signal and a stop signal to the controller; and

an emergency stop switch that is connected to the controller to transmit an emergency stop signal to the controller.

【Claim 19】

The pneumatic device of claim 18, wherein the rearward movement detecting switch and the forward movement detecting switch are installed on an upper rear side and an upper front side of the driving unit, respectively.

【Claim 20】

The pneumatic device of claim 13, wherein the control unit comprises:

a pneumatic actuator that is connected to the driving unit to supply a pneumatic pressure to the driving unit according to a control signal of a controller;

a controller that controls an operation of the pneumatic actuator according to various switch input signals;

an operating switch that is connected to the controller to transmits an initial operation signal and a stop signal to the controller;

an emergency stop switch that is connected to the controller to transmit an emergency stop signal to the controller; and

a timer that is connected to the controller to operate the pneumatic actuator for a preset time period.

【Claim 21】

The pneumatic device of claim 13, wherein the driving unit uses at least one of a hydraulic cylinder, a pneumatic cylinder, and an electric actuator, and the control unit performs reciprocations for laying power lines at a preset period.

【Claim 22】

The pneumatic device of claim 21, wherein the control unit generates a power line laying force at an arbitrary operation

period in which a valve of a flow amount control and a time delay function is interposed in the case of a hydraulic or pneumatic type.

【Claim 23】

The pneumatic device of claim 1, wherein the unit controllers of the control unit synchronizes the gripping units disposed in allocated areas of the cable tray and the driving unit to pull the power line.

【Claim 24】

The pneumatic device of claim 1, wherein the central controller of the control unit calculates and displays arrangement locations of the gripping units installed on the cable tray and the driving unit.

【Claim 25】

A method for controlling a pneumatic device for power line-laying robots, in which a control unit comprising a controller, to which switch signals of a forward movement detecting switch, a rearward movement detecting switch, an operating switch, and an emergency stop switch are input, and a pneumatic actuator moves a power line rearwards through a driving unit and a gripping unit connected thereto, the method comprising the steps of:

determining whether the operating switch is operated, by the controller;

supplying a pneumatic pressure to the driving unit with an operation of the pneumatic actuator by an operation signal of the controller if the operating switch is an on state after the determination;

moving the gripping unit and the power line rearwards by supplying a pneumatic pressure;

determining whether the rearward movement detecting switch is operated, by the controller;

releasing the pneumatic pressure of the driving unit through stop of the operation of the pneumatic actuator by an operation stop signal of the controller if the rearward movement detecting switch is an on state after the determination;

moving the gripping unit forwards by releasing the pneumatic pressure; and

determining whether the forward movement detecting switch is operated, by the controller.

【Claim 26】

The method of claim 24, wherein if the forward movement detecting switch is in an on state after the determination of the step of determining whether the forward movement detecting switch is operated, a pneumatic pressure is supplied to the driving unit with an operation of the pneumatic actuator by an

operation signal of the controller.

【Claim 27】

The method of claim 24, wherein if the operating switch is switched off or the emergency stop switch is switched on in the control steps, the functions of all control components, including the pneumatic actuator, are stopped by the controller.