



(11) **EP 4 037 119 A1**

(12) **EUROPEAN PATENT APPLICATION**  
published in accordance with Art. 153(4) EPC

(43) Date of publication:  
**03.08.2022 Bulletin 2022/31**

(21) Application number: **20869074.3**

(22) Date of filing: **28.08.2020**

(51) International Patent Classification (IPC):  
**H02G 1/14** <sup>(2006.01)</sup> **B21F 15/00** <sup>(2006.01)</sup>  
**H01R 43/052** <sup>(2006.01)</sup>

(52) Cooperative Patent Classification (CPC):  
**B21F 15/00; H01R 43/045; H01R 43/052;**  
**H02G 1/14**

(86) International application number:  
**PCT/JP2020/032591**

(87) International publication number:  
**WO 2021/059864 (01.04.2021 Gazette 2021/13)**

(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB**  
**GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO**  
**PL PT RO RS SE SI SK SM TR**  
Designated Extension States:  
**BA ME**  
Designated Validation States:  
**KH MA MD TN**

(30) Priority: **25.09.2019 JP 2019174679**

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(54) **WIRE-SHAPED MEMBER ARRANGING DEVICE, AND WIRE-SHAPED MEMBER ARRANGING METHOD**

(57) Provided is a technology for more accurately arranging wire-shaped members. A fixing unit (20) that switches between a state in which a wire-shaped member which is conveyed by means of a movement unit (10) is fixed, and a state in which the wire-shaped member is released has the function of causing the wire-shaped

member to move in an extending direction. By changing the distance between a first guide unit (31) and a second guide unit (32), a control unit (40) sets the first guide unit and the second guide unit to an arrangement state for guiding the wire-shaped member while separated by a prescribed interval.

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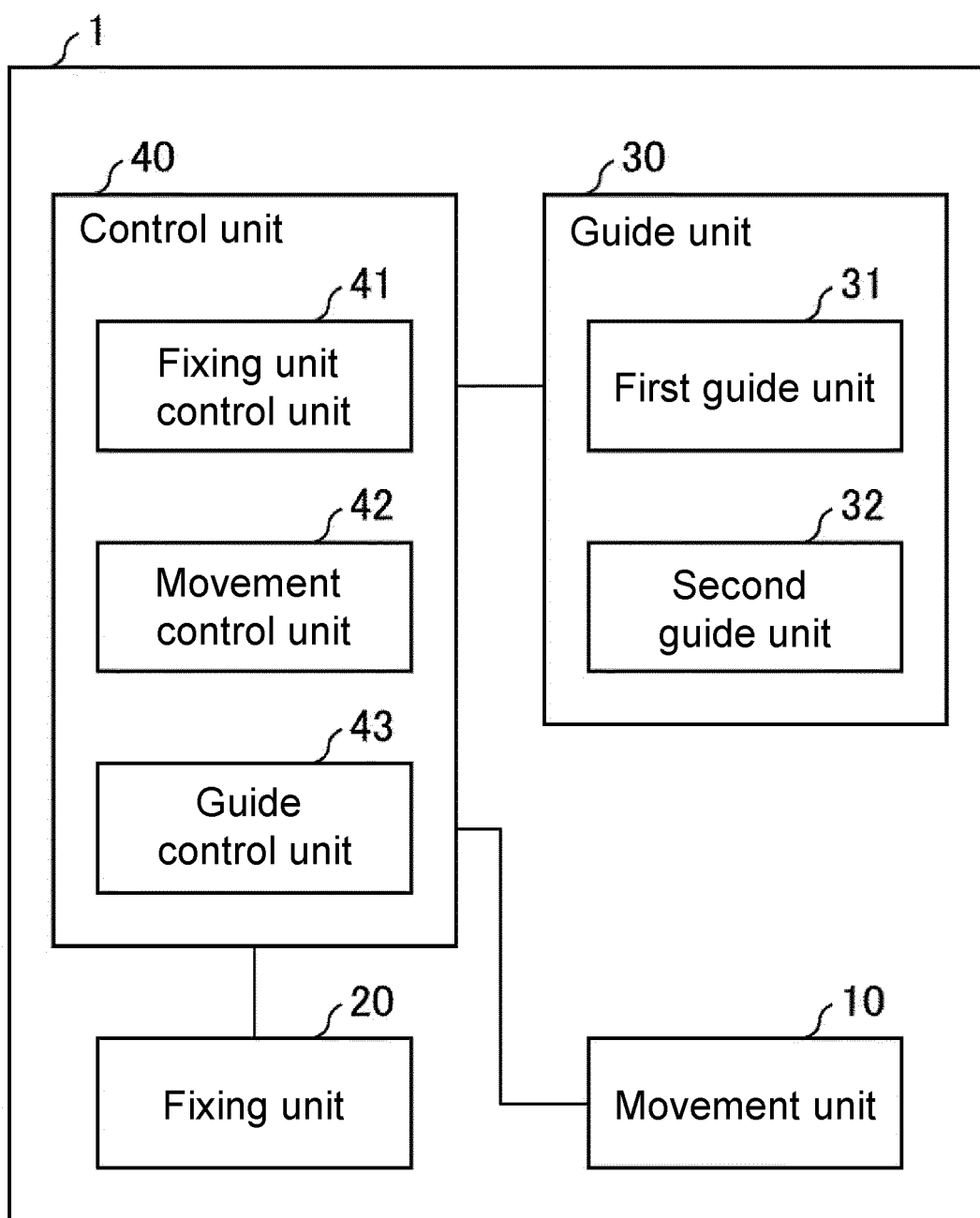


FIG. 1

## Description

### Technical Field

**[0001]** The invention relates to a wire-shaped member arranging device and a wire-shaped member arranging method.

### Related Art

**[0002]** In the conventional art, for a wire-shaped member such as a lead wire, the tip of the wire-shaped member is positioned when being crimped to a terminal.

**[0003]** Patent Document 1 proposes, for a covered wire where an end is fixed to the terminal, a device for positioning the tip by chucking, by using a clamp unit, the vicinity of the tip of the covered wire on the side opposite to the end fixed to the terminal in the same device. According to the device, by chucking the vicinity of the tip of the covered wire by using the clamp unit, the tip of the covered wire hardly swings. Even in the case where the tip of the covered wire swings, since the vicinity of the end of the covered wire is chucked by the clamp unit, the swing width is reduced.

### Citation List

#### Patent Literature

**[0004]** [Patent Literature 1] Japanese Laid-Open No. H08-102354 (published on April 16, 1996).

## SUMMARY OF INVENTION

### Technical Problem

**[0005]** However, after the device chucks the lead wire by using the clamp unit, the relative position between the clamp unit and the lead wire cannot be changed. Therefore, the accuracy of positioning the tip of the lead wire depends on the accuracy of the clamp unit, the position accuracy of the robot conveying the lead wire to the clamp unit, and the accuracy of the delivery chuck delivering the head wire to the clamp unit. In other words, it is difficult to increase the accuracy of positioning the tip of the lead wire.

**[0006]** An aspect of the disclosure has been made in view of the above, and an objective thereof is to provide a technique for accurately positioning the tip of a wire-shaped member. Solution to Problem

**[0007]** In order to solve the above issue, the following configuration is adopted.

**[0008]** That is, a wire-shaped member arranging device according to an aspect of the disclosure is a wire-shaped member arranging device for arranging a wire-shaped member to a prescribed position. The wire-shaped member arranging device includes: a movement unit, conveying the wire-shaped member; a fixing unit,

switching between a state in which the wire-shaped member conveyed by the movement unit is fixed and a state in which the wire-shaped member is released; a guide unit, guiding the wire-shaped member while separated by a prescribed interval in a state in which the wire-shaped member is fixed to the fixing unit; and a control unit, controlling operations of the movement unit, the fixing unit, and the guide unit. The fixing unit has a function of moving the wire-shaped member in an extending direction. The guide unit includes a first guide unit and a second guide unit, and a distance between the first guide unit and the second guide unit is variable. By changing the distance between the first guide unit and the second guide unit, the control unit sets the first guide unit and the second guide unit to an arrangement state for guiding the wire-shaped member while separated by the prescribed interval.

### Effects of Invention

**[0009]** According to an aspect of the invention, the tip of the wire-shaped member can be accurately positioned.

## BRIEF DESCRIPTION OF DRAWINGS

### [0010]

FIG. 1 is a block diagram illustrating a configuration of main components in a wire-shaped member arranging device according to an embodiment.

FIG. 2 is a perspective view illustrating a configuration of the wire-shaped member arranging device according to the embodiment.

FIG. 3 is a schematic view from a direction perpendicular to an extending direction of a wire-shaped member of the wire-shaped member arranging device according to the embodiment.

FIG. 4 is a schematic view from the extending direction of the wire-shaped member of the wire-shaped member arranging device according to the embodiment.

FIG. 5 is an enlarged view illustrating a portion indicated by PP in FIG. 4.

FIG. 6 is a view illustrating an example of the configuration of the main parts of the wire-shaped member arranging device according to the embodiment.

FIG. 7 is a view illustrating an example of the order of processes of the wire-shaped member arranging device according to the embodiment.

## DESCRIPTION OF EMBODIMENTS

**[0011]** Hereinafter, an embodiment according to one aspect of the invention (hereinafter, also referred to as "the embodiment") will be described with reference to the drawings.

## 1. Application Example

**[0012]** The configuration of a wire-shaped member arranging device according to the embodiment will be briefly described with reference to FIG. 1. FIG. 1 is a block diagram illustrating the configuration of the main components in the wire-shaped member arranging device according to the embodiment.

**[0013]** A wire-shaped member arranging device 1 is a device which at least includes a movement unit 10, a fixing unit 20, a guide unit 30, and a control unit 40, and arranges a tip of a wire-shaped member 50 to a prescribed position.

**[0014]** The movement unit 10 conveys the wire-shaped member 50 to the fixing unit 20. The fixing unit 20 switches between a state in which the wire-shaped member 50 conveyed by the movement unit 10 is fixed and a state in which the wire-shaped member 50 is released. In addition, the fixing unit 20 has a function of moving the wire-shaped member 50 in an extending direction.

**[0015]** The guide unit 30 includes a first guide unit 31 and a second guide unit 32. The guide unit 30 guides the wire-shaped member 50 while separated by a prescribed interval in the state in which the wire-shaped member 50 is fixed to the fixing unit 20. The first guide unit 31 and the second guide unit 32 perform an operation of sandwiching the wire-shaped member 50, and the distance between the first guide unit 31 and the second guide unit 32 is variable.

**[0016]** The control unit 40 sets the first guide unit 31 and the second guide unit 32 to an arrangement state for guiding the wire-shaped member 50 while separated by a prescribed interval by exerting control for changing of the distance between the first guide unit 31 and the second guide unit 32.

**[0017]** According to such control, for the wire-shaped member 50 conveyed by the movement unit 10, the first guide unit 31 and the second guide unit 32 can be set to the arrangement state for guiding the wire-shaped member 50 while separated by the prescribed interval by changing the distance between the first guide unit 31 and the second guide unit 32. That is, the wire-shaped member 50 can be moved in the extending direction by the fixing unit 20 in the state in which the first guide unit 31 and the second guide unit 32 guide the wire-shaped member 50 while separated by the prescribed interval. That is, the position of the wire-shaped member 50 in the extending direction can be adjusted in the state in which the tip of the wire-shaped member 50 in a direction perpendicular to the extending direction is positioned by the guide unit 30. Accordingly, it is possible to accurately position the tip of the wire-shaped member 50.

## 2. Configuration Example

<Wire-shaped Member Arranging Device>

**[0018]** In the following, an example of the configuration of the wire-shaped member arranging device 1 according to the embodiment will be described with reference to FIGs. 2 to 6. FIG. 2 is a perspective view illustrating the configuration of the wire-shaped member arranging device 1 according to the embodiment. FIG. 3 is a side view illustrating the configuration of the wire-shaped member arranging device 1 according to the embodiment from a direction perpendicular to a line extending in the extending direction of the wire-shaped member 50. FIG. 4 is a front view illustrating the configuration of the wire-shaped member arranging device 1 according to the embodiment from the direction of the line extending in the extending direction of the wire-shaped member 50. FIG. 5 is an enlarged view illustrating a portion indicated by PP in FIG. 4. In FIG. 6, a view from the top, which is a schematic view illustrating an example of the movement unit 10, the fixing unit 20 and the guide unit 30 is labeled as 501, and a view from the lateral side is labeled as 502.

**[0019]** As shown in FIGs. 2 to 6, the wire-shaped member arranging device 1 according to the embodiment includes a first movement unit 11, a second movement unit 12, a movement driving mechanism 13, a first roller 21, a second roller 22, a rotation motor 23, the first guide unit 31, the second guide unit 32, and a sensor 60.

**[0020]** As shown in FIGs. 2 to 4, the first movement unit 11, the second movement unit 12, and the movement driving mechanism 13 constitute an example of the movement unit 10. The movement driving mechanism 13 changes the diameter of a circle inscribed with the facing surface of the first movement unit 11 and the facing surface of the second movement unit 12, and changes the positions of the first movement unit 11 and the second movement unit 12 in the front-rear direction. Here, the front-rear direction is a direction along the extending direction of the wire-shaped member 50.

**[0021]** As shown in FIG. 5, the first movement unit 11 and the second movement unit 12 are able to hold the wire-shaped member 50 by sandwiching the wire-shaped member 50 in a prescribed direction, that is, the left-right direction in the figure. The diameter of the circle inscribed with the facing surface of the first movement unit 11 and the facing surface of the second movement unit 12 is variable. By making the diameter of the circle inscribed with the facing surface of the first movement unit 11 and the facing surface of the second movement unit 12 equal to the diameter of the wire-shaped member 50 or, considering the amount of elastic deformation of the wire-shaped member 50, a value slightly smaller than the diameter, the movement unit 10 can hold the wire-shaped member 50. Meanwhile, by making the diameter of the circle inscribed with the facing surface of the first movement unit 11 and the facing surface of the second movement unit 12 greater than the diameter of the wire-

shaped member 50 by a prescribed amount, the movement unit 10 can guide the wire-shaped member 50 in a state of being possible to provide a gap between the first movement unit 11 as well as the second movement unit 12 and the wire-shaped member 50.

**[0022]** In each of the first movement unit 11 and the second movement unit 12, a protrusion unit is provided at a lower part of the contact surface with the wire-shaped member 50. With the lower part of the wire-shaped member 50 being supported by the protrusion units, even in the state in which the diameter of the circle inscribed with the facing surface of the first movement unit 11 and the facing surface of the second movement unit 12 is greater than the diameter of the wire-shaped member 50 by a prescribed amount, the wire-shaped member 50 can be prevented from hanging downward.

**[0023]** Also, although the facing surface of the first movement unit 11 and the facing surface of the second movement unit 12 are parallel to each other, the invention is not limited thereto. For example, the facing surface of the first movement unit 11 and the facing surface of the second movement unit 12 may also be arranged to incline an angle from the state of being parallel to each other. In such configuration, if the configuration of at least one of the first movement unit 11 or the second movement unit 12 is a configuration in which the distance between the first movement unit 11 and the second movement unit 12 is reduced at the lower part of the contact surface with the wire-shaped member 50, the wire-shaped member 50 can be prevented from hanging downward even if the protrusion unit is not provided.

**[0024]** As shown in FIGs. 2 to 4 and 6, the first roller 21, the second roller 22, and the rotation motor 23 constitute an example of the fixing unit 20. By arbitrarily rotating the second roller 22, for example, the rotation motor 23 moves the wire-shaped member 50 in the extending direction. In addition, the first roller 21 and the second roller 22 are configured to face each other with the respective roller surfaces. By changing the distance between the first roller 21 and the second roller 22, the fixing unit 20 can switch between the state in which the wire-shaped member 50 is fixed and the state in which the wire-shaped member 50 is released. In addition, by appropriately rotating the second roller 22 by using the rotation motor 23, the fixing unit 20 can easily carry out the movement of the wire-shaped member 50 in the extending direction of the wire-shaped member 50 without using the movement unit 10. Accordingly, for example, the position of the wire-shaped member 50 in the extending direction can be adjusted. As described above, by using the first roller 21, the second roller 22, and the rotation motor 23 as the fixing unit 20, the fixing unit 20 serves to provide a function of setting the state in which the wire-shaped member 50 is fixed to the fixing unit 20 or the state in which the wire-shaped member 50 is released, as well as a function of arranging the wire-shaped member 50 to a prescribed position.

**[0025]** As shown in FIGs. 2 to 4 and 6, the guide unit

30 includes the first guide unit 31 and the second guide unit 32. The first guide unit 31 and the second guide unit 32, for example, are driven by a robo cylinder or an air cylinder, etc. The robo cylinder is an electric cylinder having an AC servo motor, a ball screw, and a linear guide, etc. In addition, the first guide unit 31 and the second guide unit 32 are arranged to face each other. The first guide unit 31 and the second guide unit 32 are able to guide the wire-shaped member 50 by sandwiching the wire-shaped member 50 in a prescribed direction, that is, the top-down direction in the figure.

**[0026]** The wire-shaped member 50 may be any wire-shaped member whose tip is positioned. In the embodiment, it is assumed that the wire-shaped member 50 is a lead wire as an electric wiring.

**[0027]** The sensor 60 is an example of the detection unit. The sensor 60 is formed by, for example, a photoelectric sensor, and detects whether the wire-shaped member 50 is present at a prescribed position.

<Control Unit>

**[0028]** The fixing unit control unit 41 controls the state in which the fixing unit 20 fixes the wire-shaped member 50 and the state in which the fixing unit 20 releases the wire-shaped member 50 by controlling the fixing unit 20. In addition, the fixing unit control unit 41 controls the movement of the wire-shaped member 50 in the extending direction by controlling the fixing unit 20.

**[0029]** The movement control unit 42 controls the conveyance of the wire-shaped member 50 by controlling the movement unit 10. In addition, the movement control unit 42 performs control for fixing the movement unit 10 and the wire-shaped member 50 or releasing the fixing. That is, the movement control unit 42 controls the switching between the state in which the wire-shaped member 50 is held in the movement unit 10 and the state in which the wire-shaped member 50 is not held.

**[0030]** The guide control unit 43 controls the switching between the state in which the guide unit 30 guides the wire-shaped member 50 and the state in which the guide unit 30 does not guide the wire-shaped member 50 by controlling the relative position between the first guide unit 31 and the second guide unit 32.

### 3. Operation Example

**[0031]** In the following, an operation example of the wire-shaped member arranging device 1 is described with reference to FIG. 7. FIG. 7 is a view illustrating an example of the order of processes of the wire-shaped member arranging device 1. It is noted that the order of processes described in the following is merely an example, and the respective processes may be changed as appropriate. In addition, regarding the order of processes described in the following, steps may be omitted, replaced, and added as appropriate in accordance with the actual configuration.

**[0032]** The wire-shaped member arranging device 1 performs control so that the movement unit 10 holds the wire-shaped member 50 by using the movement control unit 42, as shown in 101. In addition, the wire-shaped member arranging device 1 arranges the wire-shaped member 50 between the first roller 21 and the second roller 22 by moving the movement unit 10 using the movement control unit 42 (first step).

**[0033]** Then, the wire-shaped member arranging device 1 fixes the wire-shaped member 50 by controlling the relative position between the first roller 21 and the second roller 22 by using the fixing unit control unit 41, as shown in 102 (second step). Then, the wire-shaped member arranging device 1 releases the fixing between the movement unit 10 and the wire-shaped member 50 and provides a prescribed gap between the first movement unit 11 as well as the second movement unit 12 and the wire-shaped member 50 by using the movement control unit 42, as shown in 103. In addition, the wire-shaped arranging device 1 performs control for moving the movement unit 10 in the extending direction of the wire-shaped member 50 by using the movement control unit 42 (third step). Accordingly, the wire-shaped member 50 is arranged to be shaped in a linear shape between the arrangement position of the movement unit 10 and the fixing position in the fixing unit 20. That is, the subsequent sandwiching by using the first guide unit 31 and the second guide unit 32 can be accurately executed in a state in which the position of the wire-shaped member 50 is not deviated.

**[0034]** Then, the wire-shaped member arranging device 1 changes the distance between the first guide unit 31 and the second guide unit 32 by using the guide control unit 43, and controls the first guide unit 31 and the second guide unit 32 to the arrangement state for guiding the wire-shaped member 50 while separated by a prescribed distance, as shown in 104 (step 4). Then, the wire-shaped member arranging device 1 moves the movement unit 10 to a position not interfering with the positioning of the wire-shaped member 50 by using the movement control unit 42, as shown in 105 (step 5). Since the movement unit 10 is moved to a position not interfering with the positioning of the wire-shaped member 50 in 105, the movement unit 10 will be omitted in the following.

**[0035]** Then, the wire-shaped member arranging device 1 moves the wire-shaped member 50 in a prescribed direction, that is, the direction from right to left in FIG. 7, by using the first roller 21 and the second roller 22 as shown in 106 (step 6). In other words, by using the fixing unit 20, the wire-shaped member 50 is moved from a state of protruding to a side opposite to the side of the fixing unit 20 from the first guide unit 31 and the second guide unit 32 to the side of the fixing unit 20.

**[0036]** Then, the wire-shaped member arranging device 1 moves the wire-shaped member 50 until the sensor 60 is unable to detect the wire-shaped member 50, as shown in 107 (step 7). Accordingly, by arranging the wire-shaped member 50 to a state of being hidden in the first

guide member 31 and the second guide member 32, the upward, downward, leftward and rightward swinging of the tip can be corrected, and the wire-shaped member can be set straight. Accordingly, the tip of the wire-shaped member can be positioned at high accuracy in the extending direction.

**[0037]** In the following, the wire-shaped member arranging device 1 moves the wire-shaped member 50 in a prescribed direction, that is, the direction from left to right in FIG. 7, by using the fixing unit control unit 41, as shown in 108 (step 8). Accordingly, by using the fixing unit 20, the tip of the wire-shaped member 50 can be accurately arranged at the prescribed position by moving the wire-shaped member 50 by a prescribed amount.

[Summary]

**[0038]** A wire-shaped member arranging device according to an aspect of the disclosure is a wire-shaped member arranging device for arranging a wire-shaped member to a prescribed position. The wire-shaped member arranging device includes: a movement unit, conveying the wire-shaped member; a fixing unit, switching between a state in which the wire-shaped member conveyed by the movement unit is fixed and a state in which the wire-shaped member is released; a guide unit, guiding the wire-shaped member while separated by a prescribed interval in a state in which the wire-shaped member is fixed to the fixing unit; and a control unit, controlling operations of the movement unit, the fixing unit, and the guide unit. the fixing unit has a function of moving the wire-shaped member in an extending direction, and The guide unit includes a first guide unit and a second guide unit, and a distance between the first guide unit and the second guide unit is variable. By changing the distance between the first guide unit and the second guide unit, the control unit sets the first guide unit and the second guide unit to an arrangement state for guiding the wire-shaped member while separated by the prescribed interval.

**[0039]** According to the configuration, the wire-shaped member can be moved in the extending direction by the fixing unit in the state in which the first guide unit and the second guide unit guide the wire-shaped member while separated by the prescribed interval. That is, the position of the wire-shaped member in the extending direction can be adjusted in the state in which the tip of the wire-shaped member in a direction perpendicular to the extending direction is positioned by the guide unit. Accordingly, it is possible to accurately position the tip of the wire-shaped member.

**[0040]** It is noted that, in the configuration, guiding the wire-shaped member while being separated by the prescribed interval includes guiding the wire-shaped member in an opening formed by separating the first guide unit and the second guide unit by the prescribed interval.

**[0041]** In the wire-shaped member arranging device according to the aspect, the fixing unit has a configuration

in which two rollers are arranged to face each other with roller surfaces, and, by changing a distance between the two rollers, the fixing unit switches between the state in which the wire-shaped member is fixed and the state in which the wire-shaped member is released.

**[0042]** According to the configuration, by appropriately rotating the rollers, the movement of the wire-shaped member in the extending direction of the wire-shaped member can be easily carried out, and the wire-shaped member can be arranged at a desired position.

**[0043]** In the configuration, the fixing unit includes a rotation motor in one of the rollers to drive the roller. According to the configuration, the movement of the wire-shaped member in the extending direction can be easily carried out.

**[0044]** In the wire-shaped member arranging device according to the aspect, the control unit moves the wire-shaped member to a side of the fixing unit to hide a tip of the wire-shaped member in the guide unit from a state in which the wire-shaped member protrudes from a side opposite to the side of the fixing unit from the guide unit by using the fixing unit, and then performs control to move the wire-shaped member from the side of the fixing unit to a side of the guide unit by a prescribed amount.

**[0045]** According to the configuration, by temporarily hiding the tip of the wire-shaped member in the guide unit, the upward, downward, leftward and rightward swinging of the tip can be corrected, and the wire-shaped member can be set straight. Then, by moving the wire-shaped member from the side of the fixing unit toward the side of the guide unit by the prescribed amount, the position of the tip of the wire-shaped member can be accurately arranged at the prescribed position.

**[0046]** The wire-shaped member arranging device according to the aspect further includes a detection unit, detecting the wire-shaped member guided in the guide unit. Based on a detection result of the detection unit, the control unit detects that the tip of the wire-shaped member is hidden in the guide unit.

**[0047]** According to the configuration, the detection on whether the tip of the wire-shaped member is hidden in the guide unit can be easily carried out by using a simple sensor unit such as a photoelectric sensor. Thus, the tip of the wire-shaped member can be easily and accurately carried out without an expensive device or performing complicated control.

**[0048]** A wire-shaped member arranging member according to the aspect is an arrangement method for a wire-shaped member in which the wire-shaped member is arranged by using the wire-shaped member arranging device. The wire-shaped member arranging method includes: a step of moving the wire-shaped member to the side of the fixing unit from the state in which the wire-shaped member protrudes to the side opposite to the side of the fixing unit from the guide unit to hide the wire-shaped member in the guide unit by using the fixing unit; and a step of subsequently moving the wire-shaped member from the side of the fixing unit toward the side

of the guide unit by the prescribed amount.

**[0049]** According to the configuration, by performing the step of moving the wire-shaped member to the side of the fixing unit to be hidden in the guide unit and the step of moving the wire-shaped member from the side of the fixing unit toward the side of the guide unit by the prescribed amount, the tip of the wire-shaped member can be easily and accurately positioned.

## 10 Reference Signs List

### [0050]

- 1: Wire-shaped member arranging device;
- 10: Movement unit;
- 20: Fixing unit;
- 21: First roller;
- 22: Second roller;
- 30: Guide unit;
- 31: First guide unit;
- 32: Second guide unit;
- 40: Control unit;
- 50: Wire-shaped member;
- 60: Sensor.

## Claims

1. A wire-shaped member arranging device for arranging a wire-shaped member to a prescribed position, the wire-shaped member arranging device comprising:
  - a movement unit, conveying the wire-shaped member;
  - a fixing unit, switching between a state in which the wire-shaped member conveyed by the movement unit is fixed and a state in which the wire-shaped member is released;
  - a guide unit, guiding the wire-shaped member while separated by a prescribed interval in a state in which the wire-shaped member is fixed to the fixing unit; and
  - a control unit, controlling operations of the movement unit, the fixing unit, and the guide unit, wherein the guide unit comprises a first guide unit and a second guide unit, and a distance between the first guide unit and the second guide unit is variable,
  - the fixing unit has a function of moving the wire-shaped member in an extending direction, and by changing the distance between the first guide unit and the second guide unit, the control unit sets the first guide unit and the second guide unit to an arrangement state for guiding the wire-shaped member while separated by the prescribed interval.

2. The wire-shaped member arranging device as claimed in claim 1,  
wherein the fixing unit has a configuration in which two rollers are arranged to face each other with roller surfaces, and, by changing a distance between the two rollers, the fixing unit switches between the state in which the wire-shaped member is fixed and the state in which the wire-shaped member is released. 5
  
3. The wire-shaped member arranging device as claimed in claim 2, 10  
the control unit performs control to move, by using the fixing unit, the wire-shaped member to a side of the fixing unit from a state in which the wire-shaped member protrudes to a side opposite to the side of the fixing unit from the guide unit to hide a tip of the wire-shaped member in the guide unit, and then move the wire-shaped member from the side of the fixing unit toward a side of the guide unit by a pre- 15  
scribed amount. 20
  
4. The wire-shaped member arranging device as claimed in claim 3, further comprising:
  - a detection unit, detecting the wire-shaped member guided in the guide unit, 25  
wherein, based on a detection result of the detection unit, the control unit detects that the tip of the wire-shaped member is hidden in the guide unit. 30
  
5. A wire-shaped member arranging method, which is an arrangement method for a wire-shaped member in which the wire-shaped member is arranged by using the wire-shaped member arranging device as claimed in claim 3 or 4, the wire-shaped member arranging method comprising: 35
  - a step of moving the wire-shaped member to the side of the fixing unit from the state in which the wire-shaped member protrudes to the side opposite to the side of the fixing unit from the guide unit to hide the wire-shaped member in the guide unit by using the fixing unit; and 40
  - a step of subsequently moving the wire-shaped member toward the side of the fixing unit by the prescribed amount. 45

50

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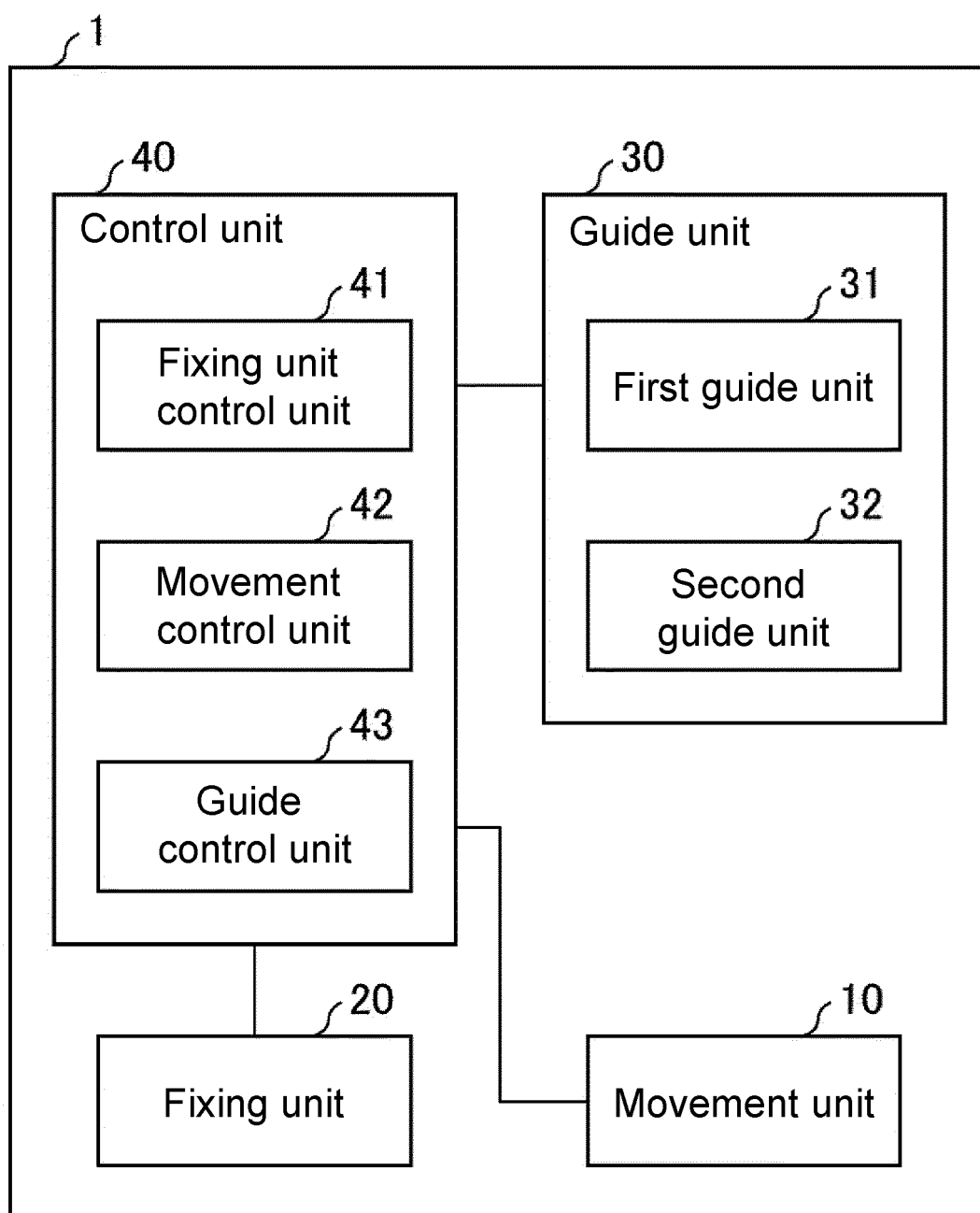


FIG. 1

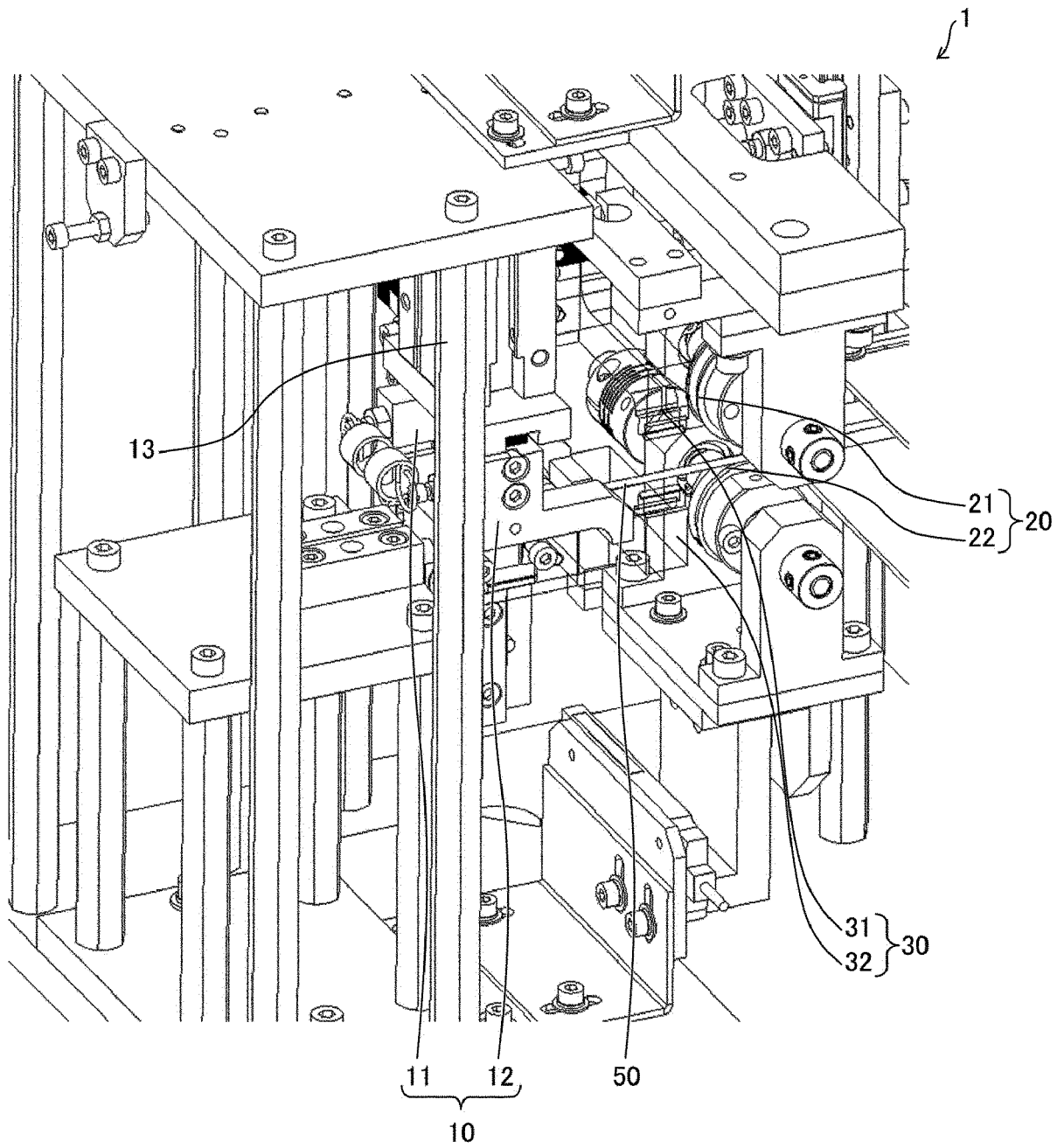


FIG. 2

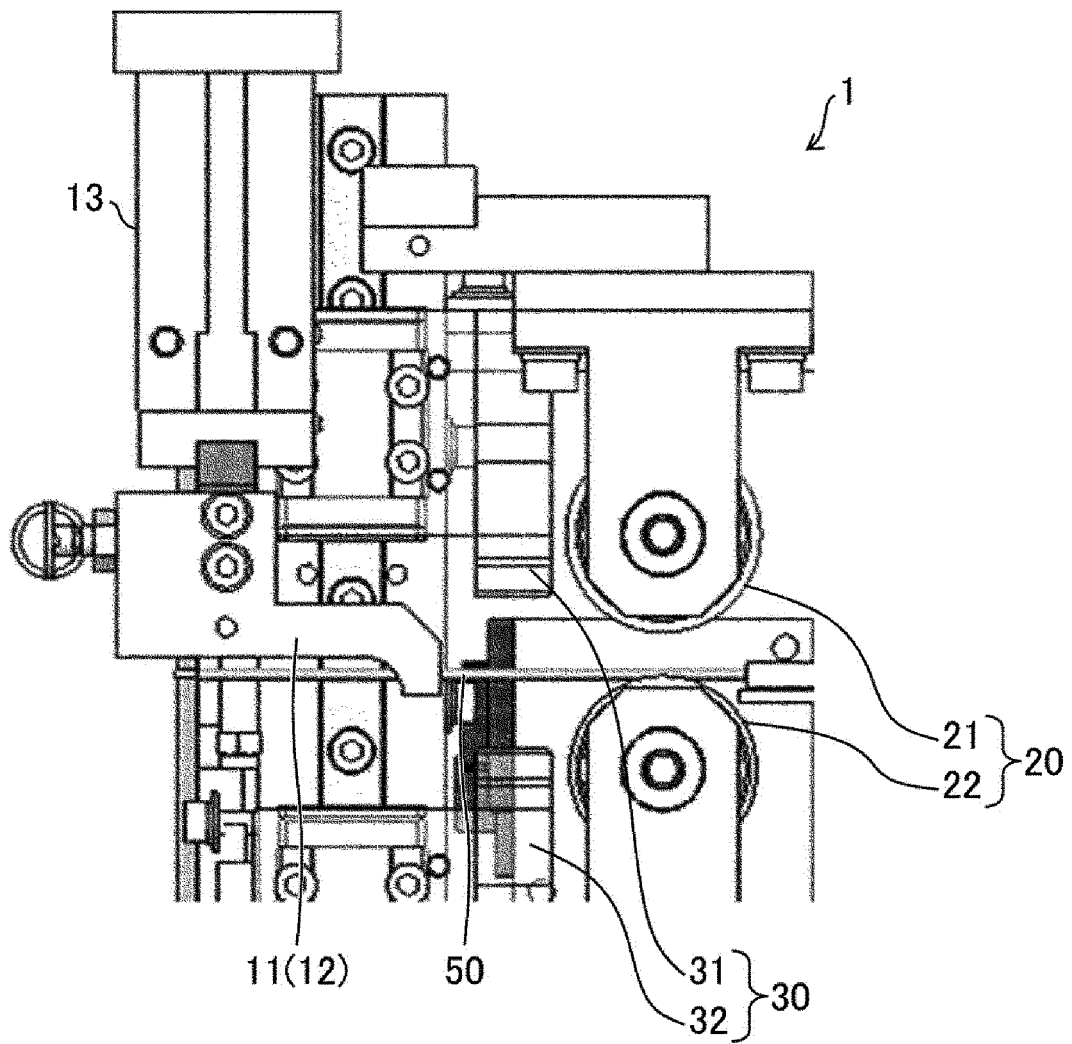


FIG. 3

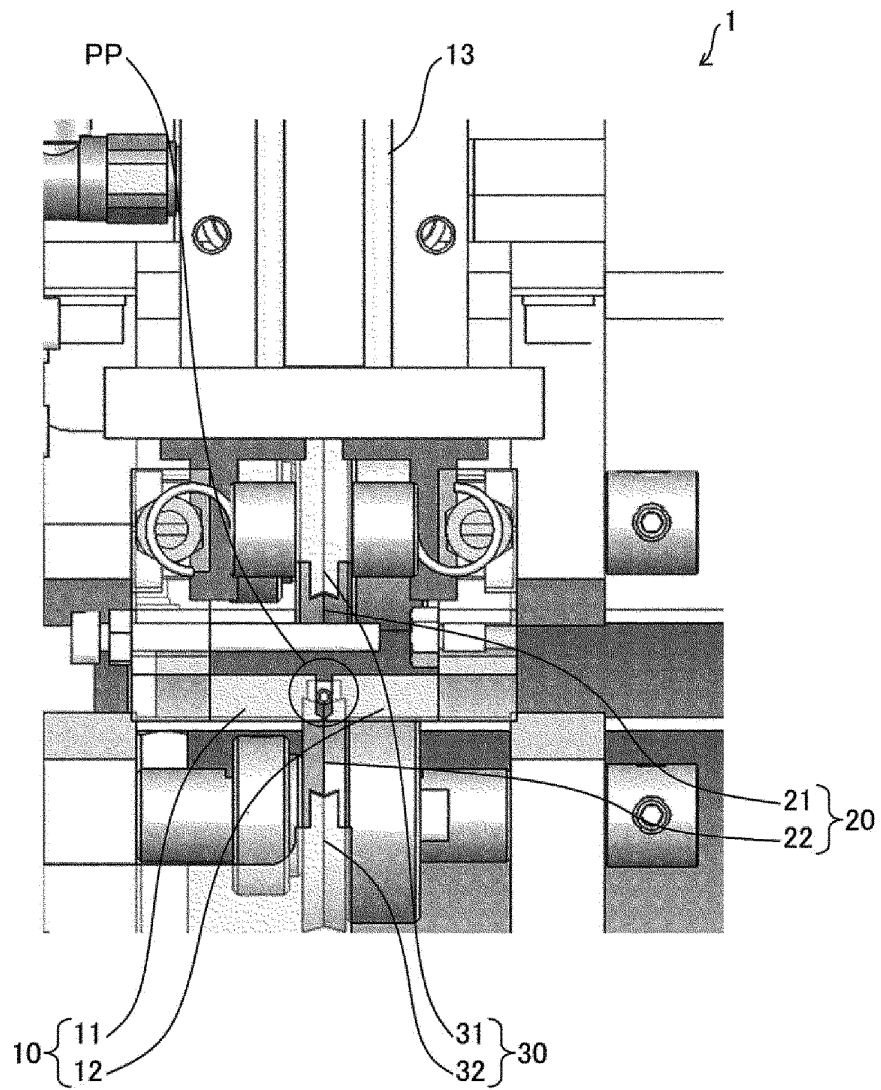


FIG. 4

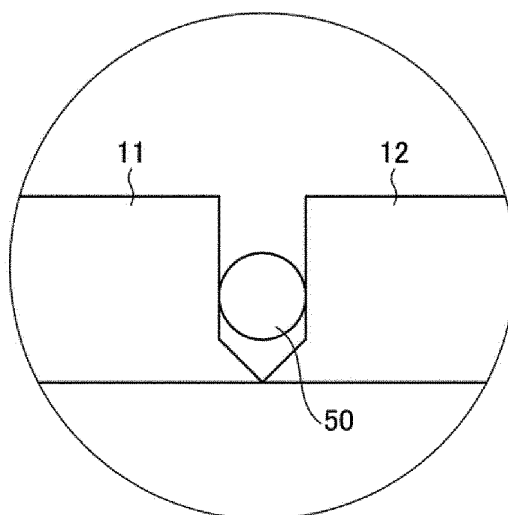


FIG. 5

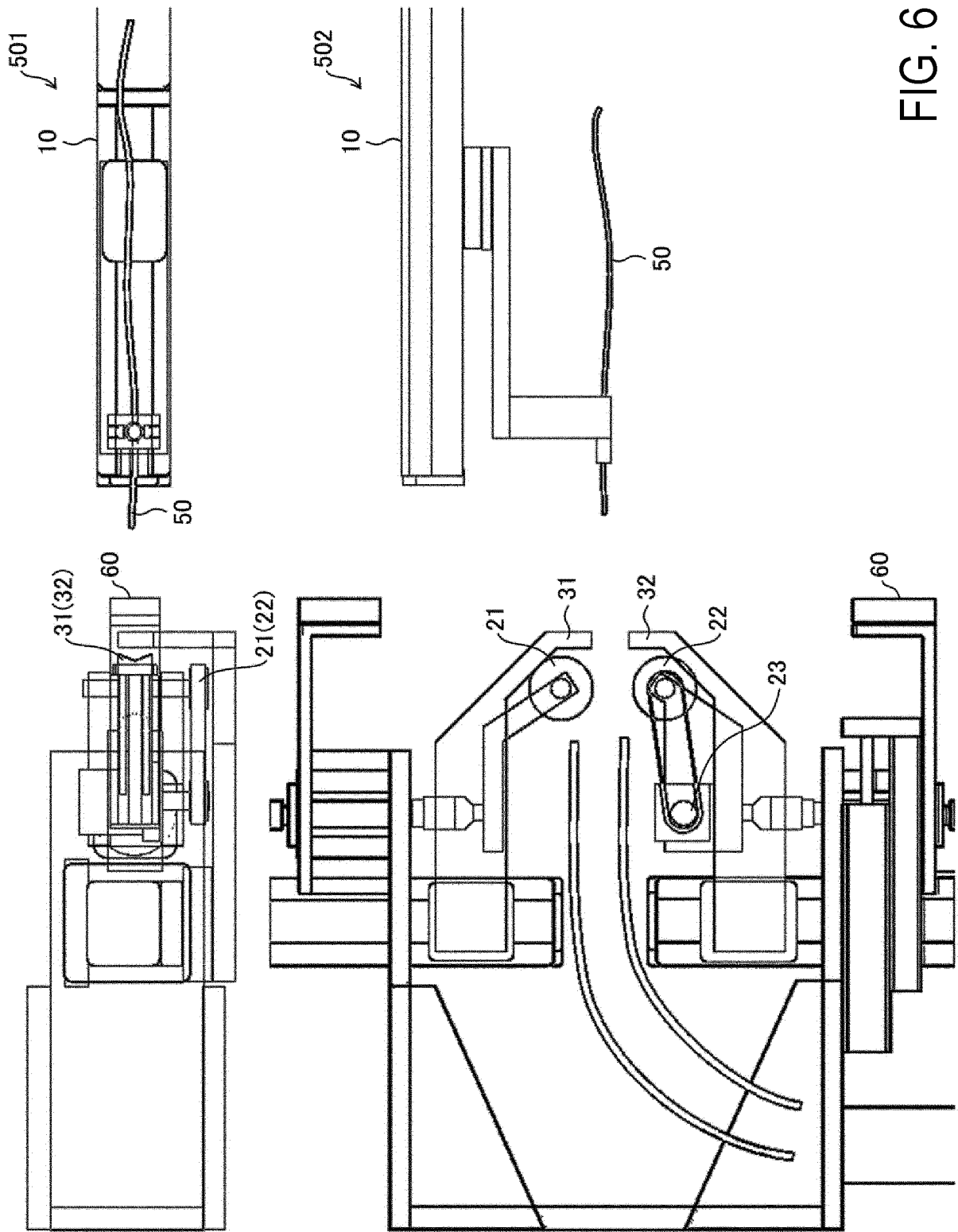


FIG. 6

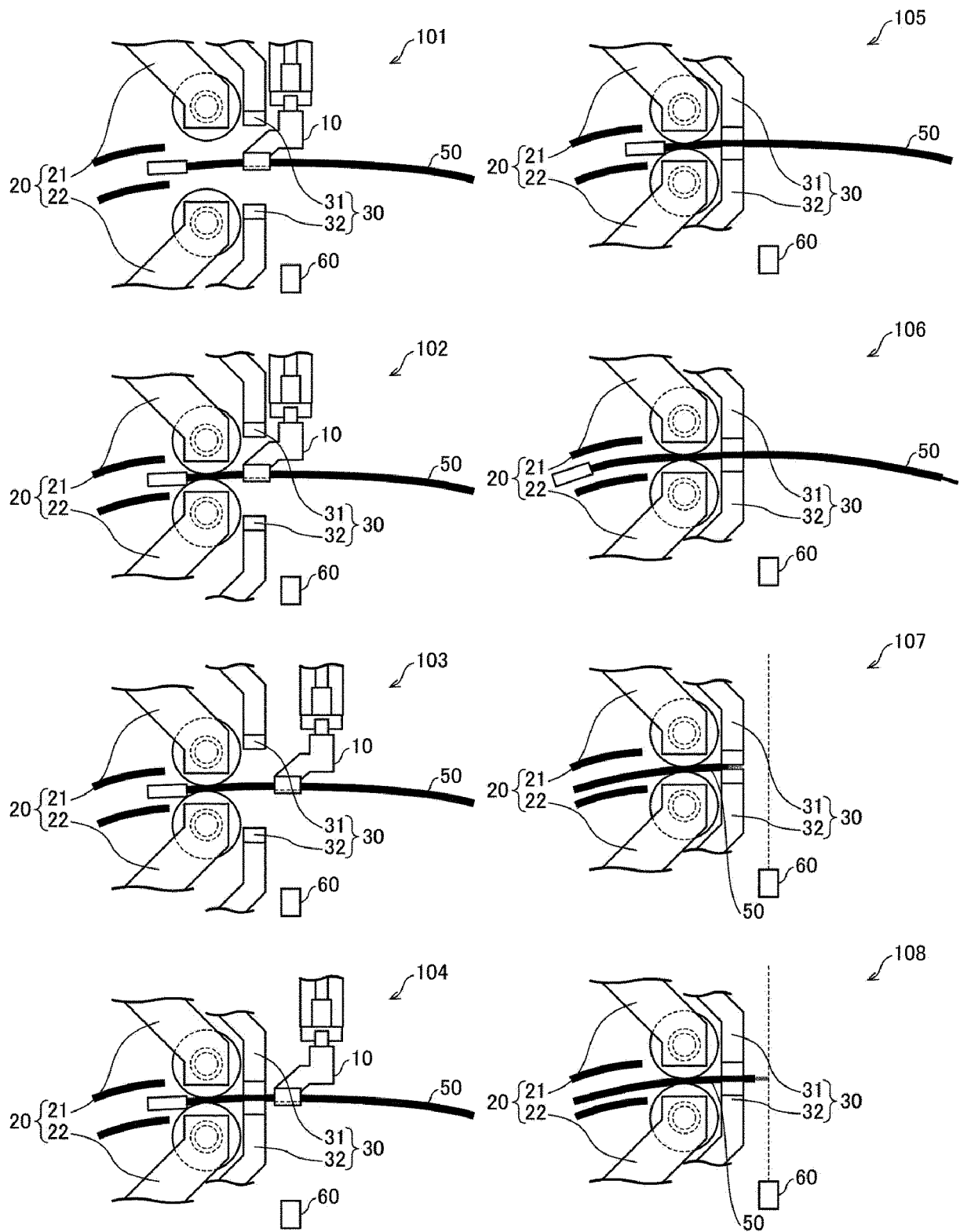


FIG. 7

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2020/032591

## A. CLASSIFICATION OF SUBJECT MATTER

H02G 1/14 (2006.01)i; B21F 15/00 (2006.01)i; H01R 43/052 (2006.01)i  
 FI: H02G1/14; H01R43/052; B21F15/00 A

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H02G1/12-1/14; B21F15/00; H01B13/00-13/012; H01R43/052

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2020
Registered utility model specifications of Japan	1996-2020
Published registered utility model applications of Japan	1994-2020

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2018-60791 A (KOMAX HOLDING AG) 12 April 2018 (2018-04-12)	1-5
A	JP 2013-105607 A (J.S.T. MFG. CO., LTD.) 30 May 2013 (2013-05-30)	1-5
A	JP 2006-346769 A (KODERA ELECTRONICS CO., LTD.) 28 December 2006 (2006-12-28)	1-5



Further documents are listed in the continuation of Box C.



See patent family annex.

\* Special categories of cited documents:

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Date of the actual completion of the international search  
06 November 2020 (06.11.2020)

Date of mailing of the international search report  
17 November 2020 (17.11.2020)

Name and mailing address of the ISA/  
Japan Patent Office  
3-4-3, Kasumigaseki, Chiyoda-ku,  
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/JP2020/032591

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP 2018-60791 A	12 Apr. 2018	US 2018/0097328 A1 EP 3301769 A1 CN 107895876 A RS 59998 B1 MA 43395 B1	
JP 2013-105607 A	30 May 2013	(Family: none)	
JP 2006-346769 A	28 Dec. 2006	(Family: none)	



**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- JP H08102354 A [0004]