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BINDING MACHINE

Abstract

A binding machine configured to wind a wire around a to-be-bound object, includes: a main body part; an arm part attached to the main body part and configured to curl the wire; a curl guide part attached to the main body part and configured to guide the wire curled by the arm part to a binding portion; and a regulating member configured to regulate relative displacement between the arm part and the curl guide part.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is based on and claims priority under 35 USC § 119 from Japanese Patent Application No. 2024-018379 filed on Feb. 9, 2024, the contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present disclosure relates to a binding machine for binding a to-be-bound object, such as a reinforcing bar, with a wire.

BACKGROUND ART

[0003] For concrete buildings, reinforcing bars are used so as to improve strength. The reinforcing bars are bound with wires so that the reinforcing bars do not deviate from predetermined positions during concrete placement.

[0004] In the related art, suggested is a binding machine referred to as a reinforcing bar binding machine configured to wind a wire on two or more reinforcing bars and to twist the wire wound on the reinforcing bars, thereby binding the two or more reinforcing bars with the wire.

[0005] When a diameter of the reinforcing bars to be bound with the wire increases, it is necessary to increase a diameter of the feeding path of the wires that are wound in an annular shape around the reinforcing bars. Therefore, a reinforcing bar binding machine is suggested which can reliably guide the wire to the binding portion even when the diameter of the feeding path of the wire, which is wound in an annular shape, increases (for example, see Patent Literature 1). [0006] Patent Literature 1: Japanese Patent No. 7302302B

[0007] In order to increase the diameter of the feeding path of the wire, which becomes an annular shape, it is necessary to enlarge a diameter of a curl forming portion that curls the wire, compared to the related art. However, in order to increase the diameter and maintain the stability of the binding, a tip portion of the curl forming portion becomes longer than that in the related art. However, when the length of the curl forming portion increases, the likelihood of positional misalignment between portions of the curl forming portion increases, and the force applied to the curl forming portion due to a drop or collision increases.

[0008] An object thereof is to provide a binding machine configured to be able to firmly maintain a curl forming portion.

SUMMARY OF INVENTION

[0009] An aspect of the present disclosure is a binding machine configured to wind a wire around a to-be-bound object, including: a main body part; an arm part attached to the main body part and configured to curl the wire; a curl guide part attached to the main body part and configured to guide the wire curled by the arm part to a binding portion; and a regulating member configured to regulate relative displacement between the arm part and the curl guide part.

[0010] In addition, another aspect of the present disclosure is a binding machine configured to wind a wire around a to-be-bound object, including: a main body part; an arm part attached to the main body part and configured to curl the wire; a curl guide part attached to the main body part; and a support member configured to support at least one of the main body part, the arm part, and the curl guide part.

Description

BRIEF DESCRIPTION OF DRAWINGS

[0011] FIG. **1** is a side view showing an example of a reinforcing bar binding machine of the present embodiment.

[0012] FIG. **2** is a perspective view of main parts showing the example of the reinforcing bar binding machine of the present embodiment.

[0013] FIG. **3** is an internal configuration view showing the example of the reinforcing bar binding

machine of the present embodiment, as seen from a side.
[0014] FIG. **4**A is a side view of main parts of the example of the reinforcing bar binding machine of the present embodiment, as seen from a side.
[0015] FIG. **4**B is a side view of main parts of the reinforcing bar binding machine of the present embodiment, with a tip guide part removed, as seen from a side.
[0016] FIG. **5**A is a side view of main parts of the example of the reinforcing bar binding machine of the present embodiment, as seen from the other side.
[0017] FIG. **5**B is a side view of main parts of the reinforcing bar binding machine of the present embodiment, with a tip guide part removed, as seen from the other side.
[0018] FIG. **6**A is a perspective view showing an example of the tip guide part.
[0019] FIG. **6**B is a perspective view showing the example of the tip guide part.
[0020] FIG. **7** is a side view of main parts showing another example of the reinforcing bar binding machine of the present embodiment, as seen from a side.
[0021] FIG. **8** is a side view of main parts showing still another example of the reinforcing bar binding machine of the present embodiment, as seen from a side.
[0022] FIG. **9** is a side view of main parts showing yet another example of the reinforcing bar binding machine of the present embodiment, as seen from a side.

DESCRIPTION OF EMBODIMENTS

[0023] Hereinafter, an example of a reinforcing bar binding machine as an embodiment of the binding machine of the present disclosure will be described with reference to the drawings.

Configuration Example of Reinforcing Bar Binding Machine of Present Embodiment

[0024] FIG. **1** is a side view showing an example of a reinforcing bar binding machine of the present embodiment, FIG. **2** is a perspective view of main parts showing the example of the reinforcing bar binding machine of the present embodiment, and FIG. **3** is an internal configuration view showing the example of the reinforcing bar binding machine of the present embodiment, as seen from a side.
[0025] A reinforcing bar binding machine **1**A has such a shape that an operator grips with a hand, and includes a main body part **10** and a handle part **11**. In addition, the reinforcing bar binding machine **1**A feeds wires W in a forward direction indicated by arrow F, winds the wires around reinforcing bars S, which are a to-be-bound object, feeds the wires W wound around the reinforcing bars S in a reverse direction indicated by arrow R, winds the wires on the reinforcing bars S, and twists the wires W, thereby binding the reinforcing bars S with the wires W. The reinforcing bar binding machine **1**A binds the reinforcing bars S with a plurality of wires W, in the present example, two wires W.
[0026] In order to implement the above-described functions, the reinforcing bar binding machine **1**A includes a magazine **2** in which the wires W are accommodated, a wire feeding portion **3** that feeds the wires W, and a wire guide portion **4** that guides the wires W, which are fed by the wire feeding portion **3**. In addition, the reinforcing bar binding machine **1**A includes a curl forming portion **5** that forms an annular feeding path for winding the wires W, which are fed by the wire feeding portion **3**, around the reinforcing bars S, and a cutting portion **6** that cuts the wires W wound on the reinforcing bars S. In addition, the reinforcing bar binding machine **1**A includes a binding portion **7** that twists the wires W wound on the reinforcing bars S, and a drive portion **8**A that drives the binding portion **7**. In addition, the reinforcing bar binding machine **1**A includes tip guide parts **9**L and **9**R against which the reinforcing bars S are abutted and which support the curl forming portion **5**.
[0027] In the reinforcing bar binding machine **1**A, an axial direction of the binding portion **7** that is driven by the drive portion **8** and rotates is indicated by arrow X, and the direction of arrow X along the axial direction of the binding portion **7** is referred to as a front-rear direction, and a side on which the curl forming portion **5** is provided is referred to as a front side. Additionally, in the reinforcing bar binding machine **1**A, a direction along an extension direction of the handle part **11**,

among directions intersecting the axial direction of the binding portion, **7** is indicated by arrow Z, and the direction of arrow Z is referred to as an up-down direction. Additionally, in the reinforcing bar binding machine **1**A, a direction intersecting the extension direction of the handle part **11**, among the directions intersecting the axial direction of the binding portion **7**, is indicated by arrow Y, and the direction of arrow Y is referred to as a left-right direction.

[0028] The magazine **2** is an example of an accommodation portion, and a reel **20** on which the long wire W is wound to be reeled out is rotatably and detachably accommodated therein. The wire W is an example of a consumable item. For the wire W, a wire made of a plastically deformable metal wire, a wire having a metal wire covered with a resin, or a twisted wire is used. In a configuration in which the reinforcing bars S are bound with two wires W, the two wires W are wound on the reel **20** and can be pulled out at the same time from the reel **20**.

[0029] The wire feeding portion **3** includes a pair of feeding gears **30** that sandwiches and feeds the wires W. In the wire feeding portion **3**, a rotating operation of a feeding motor (not shown) is transmitted to the feeding gears **30**, causing the feeding gears **30** to rotate. Additionally, in the wire feeding portion **3**, a rotation direction of the feeding motor (not shown) is switched between forward and reverse directions to switch a rotation direction of the feeding gears **30**, thereby switching a feeding direction of the wires W between the forward and reverse directions. In the configuration where the reinforcing bars S are bound with two wires W, the wire feeding portion **3** aligns the two wires W in a radial direction of the wires W and feeds the wires.

[0030] The wire guide portion **4** is arranged on upstream and downstream sides of the feeding gears **30** with respect to the feeding direction of the wires W that are fed in the forward direction. In the configuration where the reinforcing bars S are bound with two wires W, the wire guide portion **4** aligns the two entering wires W in parallel along a direction in which the pair of feeding gears **30** is aligned and guides the same between the pair of feeding gears **30**.

[0031] The curl forming portion **5** includes an arm part **50** that curls the wires W, which are fed by the wire feeding portion **3**, and a curl guide part **51** that guides the wires W curled by the arm part **50** to the binding portion **7**. The curl forming portion **5** curls the wires W, which are fed by the wire feeding portion **3** and pass through the arm part **50**, by the arm part **50**, thereby forming an annular feeding path Ru, represented by a two-dot chain line, passing through the curl guide part **51** from the arm part **50** and reaching the binding portion **7**.

[0032] The arm part **50** has a groove, which has a width through which the wires W pass and is formed along a circumferential direction of the annular feeding path Ru. In the configuration where the reinforcing bars S are bound with two wires W, the arm part **50** aligns the two entering wires W in parallel in a direction in which the wires are aligned along an axial direction of the annular feeding path Ru. In addition, the arm part **50** includes a guide surface forming portion **50***g* that guides the wires W along a radial direction of the annular feeding path Ru. The guide surface forming portion **50***g* is provided on a radially outer side of the annular feeding path Ru.

[0033] The curl guide part **51** has a groove, which has a width through which the wires W pass and is formed along the circumferential direction of the annular feeding path Ru. The curl guide part **51** is configured such that an opening area of an opening on the upstream side with respect to the feeding direction of the wires W, which are fed in the forward direction, is larger than that of an opening on the downstream side, and a part of an inner surface of the opening is tapered. In the configuration where the reinforcing bars S are bound with two wires W, the curl guide part **51** aligns the two entering wires W in parallel in a direction in which the wires are aligned along the axial direction of the annular feeding path Ru. In addition, the curl guide part **51** includes a guide surface forming portion **51***g* that guides the wires W along the radial direction of the annular feeding path Ru. The guide surface forming portion **51***g* is provided on the radially outer side of the annular feeding path Ru.

[0034] The cutting portion **6** includes a fixed blade part **60**, a movable blade part **61** that cuts the wires W in cooperation with the fixed blade part **60**, and a transmission mechanism **62** that

transmits an operation of the binding portion **7** to the movable blade part **61**. The cutting portion **6** cuts the wires W by a rotating operation of the movable blade part **61** about the fixed blade part **60** as a fulcrum shaft.

[0035] The binding portion **7** includes a wire locking body **70** to which the wires W are locked, and a sleeve **71** for actuating the wire locking body **70**. The drive portion **8** includes a twist motor **80** and a decelerator **81** that performs deceleration and torque amplification.

[0036] In the reinforcing bar binding machine **1**A, the handle part **11** extends downward from the main body part **10**. In addition, a battery **15** is detachably mounted to a lower part of the handle part **11**. In addition, in the reinforcing bar binding machine **1**A, the magazine **2** is provided in front of the handle part **11**.

[0037] In the reinforcing bar binding machine **1**A, a trigger **12** is provided on a front side of the handle part **11**, and a switch **13** is provided inside the handle part **11**. In the reinforcing bar binding machine **1**A, a control portion **100** controls the twist motor **80** and the feeding motor (not shown), in response to a state of the switch **13** that is pressed by an operation on the trigger **12**.

[0038] FIG. **4**A is a side view of main parts of the example of the reinforcing bar binding machine of the present embodiment, as seen from a side, and FIG. **4**B is a side view of main parts of the reinforcing bar binding machine of the present embodiment, with a tip guide part removed, as seen from a side. Additionally, FIG. **5**A is a side view of main parts of the example of the reinforcing bar binding machine of the present embodiment, as seen from the other side, and FIG. **5**B is a side view of main parts of the reinforcing bar binding machine of the present embodiment, with a tip guide part removed, as seen from the other side. Additionally, FIGS. **6**A and **6**B are perspective views showing an example of the tip guide part, in which FIG. **6**A shows an example of the tip guide part **9**L, and FIG. **6**B shows an example of the tip guide part **9**R.

[0039] The tip guide part **9**L is an example of a regulating means (regulating member) or support member, and is provided at an end portion on the front side of the main body part **10**, on one side. The tip guide part **9**L includes an abutting portion **9**La against which the reinforcing bars S are abutted, an arm support portion **90**L supported on the arm part **50**, a curl guide support portion **91**L supported on the curl guide part **51**, and a main body support portion **92**L supported on the main body part **10**.

[0040] The abutting portion **9**La is provided between the arm part **50** and the curl guide part **51** and protrudes further forward than the end portion on the front side of the main body part **10**.

[0041] The arm support portion **90**L is an example of a first supported portion and extends forward from the abutting portion **9**La along the arm part **50**. The arm support portion **90**L has hole portions **90**La into which screws **90***s* are inserted. The hole portions **90**La are provided at multiple locations along the extension direction of the arm support portion **90**L.

[0042] The curl guide support portion **91**L is an example of a first supported portion and extends forward from the abutting portion **9**La along the curl guide part **51**. The curl guide support portion **91**L has a hole portion **91**La into which a screw **91***s* is inserted.

[0043] The main body support portion **92**L is an example of a second supported portion and connects the arm support portion **90**L and the curl guide support portion **91**L. The main body support portion **92**L has hole portions **92**La into which screws **92**Ls are inserted.

[0044] The arm support portion **90**L extends with the main body support portion **92**L serving as a base end and tapers from the main body support portion **92**L toward a tip. That is, the arm support portion **90**L has a shape in which the base end is thicker than the tip. In addition, a length of the arm support portion **90**L along the extension direction of the arm part **50** is configured to be shorter than that of the arm part **50**. Therefore, the arm support portion **90**L does not protrude from a tip of the arm part **50**.

[0045] The tip guide part **9**L includes bent portions **93**L between the arm support portion **90**L and the main body support portion **92**L and between the curl guide support portion **91**L and the main body support portion **92**L. The bent portions **93**L are configured by providing bent portions, curved

portions, or the like, in which a step is formed, between the arm support portion **90**L and the main body support portion **92**L and between the curl guide support portion **91**L and the main body support portion **92**L.

[0046] The tip guide part **9**R is an example of a regulating means (regulating member) or support member and is provided at the end portion on the front side of the main body part **10**, on the other side. The tip guide part **9**R includes an abutting portion **9**Ra against which the reinforcing bars S are abutted, an arm support portion **90**R supported on the arm part **50**, a curl guide support portion **91**R supported on the curl guide part **51**, and a main body support portion **92**R supported on the main body part **10**.

[0047] The abutting portion **9**Ra is provided between the arm part **50** and the curl guide part **51** and protrudes further forward than the end portion on the front side of the main body portion **10**.

[0048] The arm support portion **90**R is an example of a first supported portion and extends forward from the abutting portion **9**Ra along the arm part **50**. The arm support portion **90**R has screw hole portions **90**Ra into which the screws **90***s* are fastened. The screw hole portions **90**Ra are provided at multiple locations along the extension direction of the arm support portion **90**R, in alignment with the arrangement of the hole portions **90**La.

[0049] The curl guide support portion **91**R is an example of a first supported portion and extends forward from the abutting portion **9**Ra along the curl guide part **51**. The curl guide support portion **91**R has a screw hole portion **91**Ra into which the screw **91***s* is fastened. The screw hole portion **91**Ra is provided in alignment with the arrangement of the hole portion **91**La.

[0050] The main body support portion **92**R is an example of a second supported portion and connects the arm support portion **90**R and the curl guide support portion **91**R. The main body support portion **92**R has hole portions **92**Ra into which screws **92**Rs are inserted.

[0051] The arm support portion **90**R extends with the main body support portion **92**R serving as a base end and tapers from the main body support portion **92**R toward a tip. That is, the arm support portion **90**R has a shape in which the base end is thicker than the tip. In addition, a length of the arm support portion **90**R along the extension direction of the arm part **50** is configured to be shorter than that of the arm part **50**. Therefore, the arm support portion **90**R does not protrude from the tip of the arm part **50**.

[0052] The tip guide part **9**R includes bent portions **93**R between the arm support portion **90**R and the main body support portion **92**R and between the curl guide support portion **91**R and the main body support portion **92**R. The bent portions **93**R are configured by providing bent portions, curved portions, or the like, in which a step is formed, between the arm support portion **90**R and the main body support portion **92**R and between the curl guide support portion **91**R and the main body support portion **92**R.

[0053] The arm part **50** has hole portions **50***a* into which the screws **90***s* are inserted. The hole portions **50***a* are provided at multiple locations along the extension direction of the arm part **50** in alignment with the arrangements of the hole portions **90**La and the screw hole portions **90**Ra. The hole portions **50***a* are provided on a radially outer side of the annular feeding path Ru and penetrate through the guide surface forming portion **50***g*. Thereby, the hole portions **50***a* are not exposed to the annular feeding path Ru.

[0054] The curl guide part **51** has a hole portion **51***a* into which the screw **91***s* is inserted. The hole portion **51***a* is provided in alignment with the arrangement of the hole portion **91**La and the screw hole portion **91**Ra. The hole portion **51***a* is provided on the radially outer side of the annular feeding path Ru and penetrates through the guide surface forming portion **51***g*. Thereby, the hole portion **51***a* is not exposed to the annular feeding path Ru.

[0055] The main body part **10** includes a main body-side arm support portion **95** by which the arm part **50** is supported and a main body-side curl guide support portion **96** by which the curl guide part **51** is supported. In addition, the main body part **10** includes a main body-side tip guide support portion **97**L by which the tip guide part **9**L is supported and a main body-side tip guide support

portion **97**R by which the tip guide part **9**R is supported.
[0056] The main body-side arm support portion **95** is provided on an opposite side (upper side of the binding portion **7**) to a side on which the wire feeding portion **3** and the cutting portion **6** are provided, at a position rearward along the axial direction of the binding portion **7** relative to an end portion P**1** on the front side of the main body part **10**. The main body-side arm support portion **95** supports the arm part **50** by screws **95***a*. The screw **95***a* is an example of a first support portion and supports the arm part **50** on the main body part **10** by being fastened to a female screw portion (not shown).
[0057] The main body-side curl guide support portion **96** is provided on the side (lower side of the binding portion **7**) on which the wire feeding portion **3** and the cutting portion **6** are provided, at a position rearward along the axial direction of the binding portion **7** relative to the end portion P**1** on the front side of the main body part **10**. The main body-side curl guide support portion **96** supports the curl guide part **51** by screws **96**La and **96**Ra. The screws **96**La and **96**Ra are examples of a first support portion and support the curl guide part **51** on the main body part **10** by being fastened to female screw portions (not shown).
[0058] The main body-side tip guide support portion **97**L is provided on one side intersecting the axial direction of the binding portion **7**, at a position rearward along the axial direction of the binding portion **7** relative to the end portion P**1** on the front side of the main body part **10**. The main body-side tip guide support portion **97**L supports the tip guide part **9**L by screws **92**Ls. The screw **92**Ls is an example of a third support portion and supports the tip guide part **9**L on the main body part **10** by being fastened to a fastened portion (not shown) provided in the main body part **10**.
[0059] The main body-side tip guide support portion **97**R is provided on the other side intersecting the axial direction of the binding portion **7**, at a position rearward along the axial direction of the binding portion **7** relative to the end portion P**1** on the front side of the main body part **10**. The main body-side tip guide support portion **97**R supports the tip guide part **9**R by screws **92**Rs. The screw **92**Rs is an example of a third support portion and supports the tip guide part **9**R on the main body part **10** by being fastened to a fastened portion **97**Rb (see FIG. **2**) provided in the main body part **10**. The fastened portion **97**Rb may be in the form of a nut embedded in the main body part **10**.
[0060] When the tip guide part **9**L is supported on the main body-side tip guide support portion **97**L, the arm support portion **90**L is positioned forward along the axial direction of the binding portion **7** relative to the main body-side arm support portion **95** and the screws **95***a*. In addition, when the tip guide part **9**L is supported on the main body-side tip guide support portion **97**L, the arm support portion **90**L is positioned on one side intersecting the axial direction of the binding portion **7** with respect to the arm part **50**.
[0061] In addition, when the tip guide part **9**R is supported on the main body-side tip guide support portion **97**R, the arm support portion **90**R is positioned forward along the axial direction of the binding portion **7** relative to the main body-side arm support portion **95** and the screws **95***a*. Additionally, when the tip guide part **9**R is supported on the main body-side tip guide support portion **97**R, the arm support portion **90**R is positioned on the other side intersecting the axial direction of the binding portion **7** with respect to the arm part **50**.
[0062] Accordingly, the arm support portion **90**L of the tip guide part **9**L and the arm support portion **90**R of the tip guide part **9**R are provided on both sides of the arm part **50**, and the arm part **50** is sandwiched between the arm support portion **90**L of the tip guide part **9**L and the arm support portion **90**R of the tip guide part **9**R.
[0063] In the arm support portion **90**L, the screws **90***s* pass through the hole portions **90**La. The screw **90***s* is an example of a second support portion. The screws **90***s* passing through the hole portions **90**La pass through the hole portions **50***a* of the arm part **50** and are fastened to the screw hole portions **90**Ra of the arm support portion **90**R.
[0064] Thereby, the arm part **50** is supported via the screws **90***s* by the arm support portions **90**L

and **90**R in the form of being sandwiched between the arm support portion **90**L of the tip guide part **9**L and the arm support portion **90**R of the tip guide part **9**R.

[0065] Accordingly, the arm part **50** is supported by the tip guide part **9**L via the arm support portion **90**L using the screws **90***s*, at a position forward along the axial direction of the binding portion **7** relative to the main body-side arm support portion **95** and the screws **95***a*. In addition, the arm part **50** is supported by the tip guide part **9**R via the arm support portion **90**R using the screws **90***s*, at a position forward along the axial direction of the binding portion **7** relative to the main body-side arm support portion **95** and the screws **95***a*.

[0066] In addition, when the tip guide part **9**L is supported by the main body-side tip guide support portion **97**L, the curl guide support portion **91**L is positioned forward along the axial direction of the binding portion **7** relative to the main body-side curl guide support portion **96** and the screws **96**La. In addition, when the tip guide part **9**L is supported by the main body-side tip guide support portion **97**L, the curl guide support portion **91**L is positioned on one side intersecting the axial direction of the binding portion **7** with respect to the curl guide part **51**.

[0067] In addition, when the tip guide part **9**R is supported by the main body-side tip guide support portion **97**R, the curl guide support portion **91**R is positioned forward along the axial direction of the binding portion **7** relative to the main body-side curl guide support portion **96** and the screws **96**Ra. In addition, when the tip guide part **9**R is supported by the main body-side tip guide support portion **97**R, the curl guide support portion **91**R is positioned on the other side intersecting the axial direction of the binding portion **7** with respect to the curl guide part **51**.

[0068] Accordingly, the curl guide support portion **91**L of the tip guide part **9**L and the curl guide support portion **91**R of the tip guide part **9**R are provided on both sides of the curl guide part **51**, and the curl guide part **51** is sandwiched between the curl guide support portion **91**L of the tip guide part **9**L and the curl guide support portion **91**R of the tip guide part **9**R.

[0069] In the curl guide support portion **91**L, the screw **91***s* passes through the hole portion **91**La. The screw **91***s* is an example of a second support portion. The screw **91***s* passing through the hole portion **91**La passes through the hole portion **51***a* of the curl guide part **51** and is fastened to the screw hole portion **91**Ra of the curl guide support portion **91**R.

[0070] Thereby, the curl guide part **51** is supported via the screw **91***s* by the curl guide support portions **91**L and **91**R in the form of being sandwiched between the curl guide support portion **91**L of the tip guide part **9**L and the curl guide support portion **91**R of the tip guide part **9**R.

[0071] Accordingly, the curl guide part **51** is supported by the tip guide part **9**L via the curl guide support portion **91**L using the screw **91***s*, at a position forward along the axial direction of the binding portion **7** relative to the main body-side curl guide support portion **96** and the screws **96**La. In addition, the curl guide part **51** is supported by the tip guide part **9**R via the curl guide support portion **91**R using the screw **91***s*, at a position forward along the axial direction of the binding portion **7** relative to the main body-side curl guide support portion **96** and the screws **96**Ra. Here, ‘support’ refers to preventing relative movements between the arm part **50** and the main body part **10**, between the curl guide part **51** and the main body part **10**, and between the arm part **50** and the curl guide part **51**, due to translational movement in the X, Y, and Z directions, rotational movement, and the like, and also includes fixing the objects to each other. However, unavoidable movement or movement that does not affect functionality may be included.

Example of Operational Effects of Reinforcing Bar Binding Machine of Present Embodiment

[0072] As described above, the arm part **50** is supported on the main body part **10** by the screws **95***a* through the main body-side arm support portion **95**, and is supported on the tip guide part **9**L via the arm support portion **90**L by the screws **90***s*, at a position forward along the axial direction of the binding portion **7** relative to the main body-side arm support portion **95** and the screws **95***a*. The tip guide part **9**L is supported on the main body part **10** by the screws **92**Ls through the main body-side tip guide support portion **97**L. Thereby, the arm part **50** is supported on the main body part **10** via the tip guide part **9**L by the main body-side tip guide support portion **97**L, at a part

forward along the axial direction of the binding portion **7** relative to the main body-side arm support portion **95**.

[0073] In addition, the arm part **50** is supported on the tip guide part **9**R via the arm support portion **90**R by the screws **90***s*, at a position forward along the axial direction of the binding portion **7** relative to the main body-side arm support portion **95** and the screws **95***a*. The tip guide part **9**R is supported on the main body part **10** by the screws **92**Rs through the main body-side tip guide support portion **97**R. Thereby, the arm part **50** is supported on the main body part **10** via the tip guide part **9**R by the main body-side tip guide support portion **97**R, at a part forward along the axial direction of the binding portion **7** relative to the main body-side arm support portion **95**.

[0074] Accordingly, the arm part **50** constituting the curl forming portion **5** is supported by a plurality of support portions, namely the screws **90***s* and **95***a*. Therefore, the arm part **50** can be firmly maintained. In addition, when feeding out the wires W during binding, unintentional movements, such as rattling of the arm part **50**, are suppressed, enabling stable binding. In addition, even when the arm part **50** is subjected to impacts due to a drop or collision, damage, such as deformation of the arm part **50**, can be suppressed.

[0075] In addition, the curl guide part **51** is supported on the main body part **10** by the screws **96**La and **96**Ra through the main body-side curl guide support portion **96**, and is supported on the tip guide part **9**L via the curl guide support portion **91**L by the screw **91***s*, at a position forward along the axial direction of the binding portion **7** relative to the main body-side curl guide support portion **96** and the screws **96**La and **96**Ra. The tip guide part **9**L is supported on the main body part **10** by the screws **92**Ls through the main body-side tip guide support portion **97**L. Thereby, the curl guide part **51** is supported on the main body part **10** via the tip guide part **9**L by the main body-side tip guide support portion **97**L, at a part forward along the axial direction of the binding portion **7** relative to the main body-side curl guide support portion **96**.

[0076] In addition, the curl guide part **51** is supported on the tip guide part **9**R via the curl guide support portion **91**R by the screw **91***s*, at a position forward along the axial direction of the binding portion **7** relative to the main body-side curl guide support portion **96** and the screws **96**La and **96**Ra. The tip guide part **9**R is supported on the main body part **10** by the screws **92**Rs through the main body-side tip guide support portion **97**R. Thereby, the curl guide part **51** is supported on the main body part **10** via the tip guide part **9**R by the main body-side tip guide support portion **97**R, at a part forward along the axial direction of the binding portion **7** relative to the main body-side curl guide support portion **96**.

[0077] Accordingly, the curl guide part **51** constituting the curl forming portion **5** is supported by a plurality of support portions, namely the screws **91***s*, **96**La, and **96**Ra. Therefore, the curl guide part **51** can be firmly maintained. In addition, when receiving the wires W during binding, unintentional movements, such as rattling of the curl guide part **51**, are suppressed, enabling stable binding. In addition, even when the curl guide part **51** is subjected to impacts due to a drop or collision, damage, such as deformation of the curl guide part **51**, can be suppressed.

[0078] In addition, relative displacement between the arm part **50** constituting the curl forming portion **5** and the main body part **10** is regulated by the screws **90***s* and **95***a* as support means and the tip guide parts **9**L and **9**R as regulating means. In addition, relative displacement between the curl guide part **51** constituting the curl forming portion **5** and the main body part **10** is regulated by the screws **91***s*, **96**La, and **96**Ra as support means and the tip guide parts **9**L and **9**R as regulating means. In addition, relative displacement between the arm part **50** and the curl guide part **51** is regulated by the tip guide parts **9**L and **9**R as regulating means.

[0079] Therefore, the arm part **50** and the curl guide part **51** can be firmly maintained. In addition, when feeding out the wires W and receiving the wires W during binding, unintentional movements, such as rattling of the arm part **50** and the curl guide part **51**, are suppressed, enabling stable binding. In addition, even when the arm part **50** and the curl guide part **51** are subjected to impacts due to a drop or collision, damage, such as deformation of the arm part **50** and the curl guide part

51, can be suppressed.

[0080] In addition, the tip guide part **9**L includes the bent portions **93**L between the arm support portion **90**L and the main body support portion **92**L and between the curl guide support portion **91**L and the main body support portion **92**L, and the tip guide part **9**R includes the bent portions **93**R between the arm support portion **90**R and the main body support portion **92**R and between the curl guide support portion **91**R and the main body support portion **92**R, so that when the arm part **50** and the curl guide part **51** are subjected to impacts due to a drop or collision, the impacts can be absorbed by elastic deformation of the bent portions **93**L and **93**R.

[0081] The tip guide part **9**L is supported on the main body portion **10** by the screws **92**Ls, on the arm part **50** by the screws **90***s*, and on the curl guide part **51** by the screw **91***s*. In addition, the tip guide part **9**R is supported on the main body portion **10** by the screws **92**Rs, on the arm part **50** by the screws **90***s*, and on the curl guide part **51** by the screw **91***s*. The abutting portion **9**La of the tip guide part **9**L and the abutting portion **9**Ra of the tip guide part **9**R are likely to wear out due to the abutting of the reinforcing bars S. Therefore, the tip guide parts **9**L and **9**R are detachably supported on the main body part **10**, the arm part **50**, and the curl guide part **51** using fastening members such as screws, enabling easy replacement.

Variations of Reinforcing Bar Binding Machine of Present Embodiment

[0082] The tip guide part **9**L may be configured to include the abutting portion **9**La and the arm support portion **90**L without including the curl guide support portion **91**L. In addition, the tip guide part **9**L may be configured to include the abutting portion **9**La and the curl guide support portion **91**L without the arm support portion **90**L. The same applies to the tip guide part **9**R.

[0083] In addition, the tip guide parts **9**L and **9**R may be made of metal or resin. When the tip guide parts **9**L and **9**R and the arm part **50** are made of metal, the tip guide parts **9**L and **9**R and the arm part **50** may be supported by welding or the like without considering attachment or detachment. Likewise, when the tip guide parts **9**L and **9**R and the curl guide part **51** are made of metal, the tip guide parts **9**L and **9**R and the curl guide part **51** may be supported by welding or the like without considering attachment or detachment. In addition, the tip guide parts **9**L and **9**R and the arm part **50** may be supported by adhesion or the like without considering attachment or detachment, and the tip guide parts **9**L and **9**R and the curl guide part **51** may be supported by adhesion or the like without considering attachment or detachment. In addition, the tip guide parts **9**L and **9**R and the arm part **50** may be supported by rivets, swaging, or the like without considering attachment or detachment, and the tip guide parts **9**L and **9**R and the curl guide part **51** may be supported by rivets, swaging, or the like without considering attachment or detachment.

[0084] In addition, as a form of extending a part of the main body part **10**, the arm support portions **90**L and **90**R may be formed integrally with the main body part **10**, and the curl guide support portions **91**L and **91**R may be formed integrally with the main body part **10**.

[0085] In the reinforcing bar binding machine **1**A, a configuration is known in which the curl guide part **51** is rotatably supported with the main body-side curl guide support portion **96** serving as a fulcrum, and the curl guide part **51** is urged in a predetermined direction by an urging member such as a spring. However, when the diameter of the annular feeding path Ru that wraps around the reinforcing bars S increases, it is preferable for the curl guide part **51** to be supported in order to guide the wires W curled by the arm part **50** to the binding portion **7** while keeping it in contact with the curl guide part **51**. In contrast, in a configuration where the curl guide part **51** is urged with a force that does not move the curl guide part **51** when the wires W come into contact, the curl guide part **51** may be configured to be movable. In this case, a shaft or the like that movably supports the curl guide part **51** may be configured to be supported through the tip guide parts **9**L and **9**R.

[0086] FIG. **7** is a side view of main parts showing another example of the reinforcing bar binding machine of the present embodiment, as seen from a side. A reinforcing bar binding machine **1**B includes a support member **98**L that regulates the relative displacement between the arm part **50**

and the curl guide part **51**. Note that a similar support member is also provided on the other side, but the support member on the other side is not shown.

[0087] The support member **98**L is an example of a regulating means and includes an arm support portion **98***a* supported on the arm part **50**, a curl guide support portion **98***b* supported on the curl guide part **51**, and a connecting portion **98***c* connecting the arm support portion **98***a* and the curl guide support portion **98***b*.

[0088] In the support member **98**L, the arm support portion **98***a* is positioned forward along the axial direction of the binding portion **7** relative to the main body-side arm support portion **95** and the screws **95***a* shown in FIGS. **5**A and **5**B. Additionally, in the support member **98**L, the curl guide support portion **98***b* is positioned forward along the axial direction of the binding portion **7** relative to the main body-side curl guide support portion **96** and the screws **96**La. Additionally, the support member **98**L is provided on one side of the reinforcing bar binding machine **1**B, and the support member, not shown, is provided on the other side of the reinforcing bar binding machine **1**B. Thereby, the arm part **50** is sandwiched between the arm support portions **98***a* of the pair of support members. Additionally, the curl guide part **51** is sandwiched between the curl guide support portions **98***b* of the pair of support members. The arm support portion **98***a* is supported on the arm part **50** by screws **98***s***1**. Additionally, the curl guide support portion **98***b* is supported on the curl guide part **51** by a screw **98***s***2**. The support location by the screws **98***s***1** is positioned forward along the axial direction of the binding portion **7** relative to the main body-side arm support portion **95** and the screws **95***a* shown in FIGS. **5**A and **5**B. Additionally, the support location by the screw **98***s***2** is positioned forward along the axial direction of the binding portion **7** relative to the main body-side curl guide support portion **96** and the screws **96**La.

[0089] The support member **98**L includes bent portions **98***e* between the arm support portion **98***a* and the connecting portion **98***c* and between the curl guide support portion **98***b* and the connecting portion **98***c*.

[0090] The reinforcing bar binding machine **1**B includes an abutting portion **98***d* against which the reinforcing bars S are abutted. The abutting portion **98***d* is provided between the arm part **50** and the curl guide part **51** and protrudes further forward than the end portion on the front side of the main body portion **10**. The abutting portion **98***d* is supported on the main body part **10** by screws **98***ds*. In the reinforcing bar binding machine **1**B, the support member **98**L and the abutting portion **98***d* are configured as separate components.

[0091] FIG. **8** is a side view of main parts showing still another example of the reinforcing bar binding machine of the present embodiment, as seen from a side. A reinforcing bar binding machine **1**C includes a tip guide part **9**L (**9**R) against which the reinforcing bars S are abutted and which supports the curl forming portion **5**. In FIG. **8**, the tip guide part **9**R is not shown.

[0092] The tip guide part **9**L is an example of a support member and is provided at an end portion on the front side of the main body portion **10**, on one side. The tip guide part **9**L includes an abutting portion **9**La against which the reinforcing bars S are abutted, an arm support portion **90**L supported on the arm part **50**, a curl guide support portion **91**L supported on the curl guide part **51**, and a main body support portion **92**L supported on the main body part **10**.

[0093] The abutting portion **9**La is provided between the arm part **50** and the curl guide part **51** and protrudes further forward than the end portion on the front side of the main body portion **10**.

[0094] The arm support portion **90**L is an example of a first supported portion and extends forward from the abutting portion **9**La along the arm part **50**. The arm support portion **90**L is supported on the arm part **50** by the screws **90***s*. The arm support portion **90**L includes a contact portion **99**La with which the reinforcing bars S can come into contact. The contact portion **99**La protrudes toward the curl guide part **51** side with respect to an opposing surface **50***h* of the arm part **50** facing the curl guide part **51**. Note that the contact portion **99**La may be flush with the opposing surface **50***h*.

[0095] The curl guide support portion **91**L is an example of a first supported portion and extends

forward from the abutting portion **9**La along the curl guide part **51**. The curl guide support portion **91**L is supported on the curl guide part **51** by the screw **91***s*. The curl guide support portion **91**L includes a contact portion **99**Lb with which the reinforcing bars S can come into contact. The contact portion **99**Lb extends forward from the abutting portion **9**La along the curl guide part **51**, and protrudes toward the arm part **50** side with respect to an opposing surface **51***h* of the curl guide part **51** facing the arm part **50**. Note that the contact portion **99**Lb may be flush with the opposing surface **51***h*.

[0096] The main body support portion **92**L is an example of a second supported portion and connects the arm support portion **90**L and the curl guide support portion **91**L. The main body support portion **92**L is supported on the main body part **10** by screws **92**Ls.

[0097] The tip guide part **9**L includes bent portions **93**L between the arm support portion **90**L and the main body support portion **92**L and between the curl guide support portion **91**L and the main body support portion **92**L. The bent portions **93**L are configured by providing bent portions, curved portions, or the like, in which a step is formed, between the arm support portion **90**L and the main body support portion **92**L and between the curl guide support portion **91**L and the main body support portion **92**L.

[0098] In the reinforcing bar binding machine **1**C, when the reinforcing bars S are inserted between the arm part **50** and the curl guide part **51**, the reinforcing bars S may come into contact with the contact portions **99**La and **99**Lb. By providing the contact portions **99**La and **99**Lb, the reinforcing bars S are suppressed from coming into contact with the arm part **50** and the curl guide part **51**. In addition, when the contact portions **99**La and **99**Lb are worn as a result of the reinforcing bars S coming into contact, it is sufficient to replace the tip guide part **9**L, which can suppress wear of the arm part **50** and the curl guide part **51**. Either the contact portion **99**La or the contact portion **99**Lb may be provided.

[0099] FIG. **9** is a side view of main parts showing yet another example of the reinforcing bar binding machine of the present embodiment, as seen from a side.

[0100] In a reinforcing bar binding machine **1**D, a tip guide part **99**L includes an escape portion **99**Lc. The escape portion **99**Lc is a space for increasing a shortest distance dimension between the tip guides on both sides so that when a twisted portion of the wire W twisted by the binding portion **7** separates from the binding portion **7**, the wire is not caught on the tip guide part **99**L, more specifically, an end portion of the wire, which is farther than the twisted portion, is not caught on the tip guide part **99**L and escapes smoothly. The escape portion **99**Lc may also be provided on the tip guide part (not shown) provided on the other side, and may be applied to all of the above-described embodiments. In addition, although the escape portion **99**Lc is shown as an arc-shaped gap, the escape portion may be formed by increasing a distance between the contact portions of the tip guides provided on both sides.

[0101] Note that the arm part **50** may be attached as a separate body to the main body part **10**, or may be provided integrally with the main body part **10**. For example, the arm part **50** may extend from the main body part **10**.

[0102] As described above, an aspect of the present disclosure is a binding machine configured to wind a wire around a to-be-bound object, including: a main body part; an arm part attached to the main body part and configured to curl the wire; a curl guide part attached to the main body part and configured to guide the wire curled by the arm part to a binding portion; and a regulating member configured to regulate relative displacement between the arm part and the curl guide part.

[0103] In addition, another aspect of the present disclosure is a binding machine configured to wind a wire around a to-be-bound object, including: a main body part; an arm part attached to the main body part and configured to curl the wire; a curl guide part attached to the main body part; and a support member configured to support at least one of the main body part, the arm part, and the curl guide part.

[0104] In the present disclosure, the relative displacement between the arm part and the curl guide

part can be regulated. In addition, in the present disclosure, the arm part and the curl guide part can be firmly maintained. In addition, when feeding or receiving the wire during binding, unintentional movements, such as rattling of the arm part and the curl guide part, are suppressed, enabling stable binding. Further, even when the arm part or curl guide part is subjected to impacts due to a drop or collision, damage, such as deformation of the curl forming portion, can be suppressed.
[0105] According to the present disclosure, it is possible to provide a binding machine configured to be able to firmly maintain a curl forming portion.

Claims

1. A binding machine configured to wind a wire around a to-be-bound object, comprising: a main body part; an arm part attached to the main body part and configured to curl the wire; a curl guide part attached to the main body part and configured to guide the wire curled by the arm part to a binding portion; and a regulating member configured to regulate relative displacement between the arm part and the curl guide part.
2. The binding machine according to claim 1, wherein the regulating member is a member different from the main body part, the arm part, and the curl guide part.
3. The binding machine according to claim 1, wherein the regulating member is configured to regulate relative displacement among the arm part, the curl guide part, and the main body part.
4. A binding machine configured to wind a wire around a to-be-bound object, comprising: a main body part; an arm part attached to the main body part and configured to curl the wire; a curl guide part attached to the main body part; and a support member configured to support at least one of the main body part, the arm part, and the curl guide part.
5. The binding machine according to claim 4, wherein the arm part and the curl guide part are each supported on the main body part by the support member.
6. The binding machine according to claim 5, wherein the arm part, the curl guide part, and the main body part are each supported by the support member.
7. The binding machine according to claim 4, wherein the support member comprises a bent portion.
8. The binding machine according to claim 4, wherein the support member comprises a contact portion protruding further toward the curl guide part than the arm part, or protruding further toward the arm part than the curl guide part.
9. The binding machine according to claim 4, wherein the support member extends with a support location, serving as a base end, between the main body part and the arm part or the curl guide part, and tapers from the base end toward a tip in an extension direction of the arm part or the curl guide part.
10. The binding machine according to claim 4, wherein the support member extends with a support location, serving as a base end, between the main body part and the arm part or the curl guide part and comprises a tip in an extension direction of the arm part or the curl guide part from the base end, and the base end is thicker than the tip.
11. The binding machine according to claim 4, wherein a support location between the support member and the arm part or the curl guide part is provided at a location different from a path of the wire.
12. The binding machine according to claim 4, wherein the support member is provided on both sides of the arm part or the curl guide part.
13. The binding machine according to claim 4, wherein the support member comprises an abutting portion against which the to-be-bound object is to be abutted.
14. The binding machine according to claim 4, wherein the support member comprises an escape portion with which the wound wire does not interfere.