

STEEL BAR GRIPPING APPARATUS

BACKGROUND OF THE INVENTION

Field of the Invention

5 The present invention relates to a steel bar gripping apparatus, and more particularly to a steel bar gripping apparatus capable of gripping a rebar while rotating the rebar by a predetermined angle during the supply of the rebar to a press apparatus that presses an end of the rebar.

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Description of the Related Art

 A steel bar is used as a basic skeletal component of a reinforced concrete structure. In general, the steel bar is manufactured so as to have a predetermined diameter and length and supplied to a civil engineering/construction site, and it is necessary to extend the length of the steel bar on site, as needed. In order to extend the length of a ready-made steel bar, an extension coupler is mounted on an end of the steel bar, and it is necessary to press the end of the steel bar using a press in order to mount the end of the steel bar to the extension coupler.

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 Korean Patent Application Publication No. 10-2010-0036519 discloses a configuration in which ends of rebars 10 are inserted into insertion holes formed in both ends of a coupler 50 shown in FIG. 1 in order to extend the rebars.

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The body of each rebar 10, which is used as a building material, is provided with nodes 20 arranged at predetermined intervals and a rib 30 formed in a longitudinal direction. In order to connect the rebars to each other for extension, a mechanical connection method is used in which a joint structure (male thread) 40 is formed at an end of each rebar 10, and the rebars are mechanically joined to each other by screw coupling or simple fitting using a coupler 50 having a female thread 51 formed therein. At this time, the diameter of the end of the rebar, i.e., a steel bar, must be reduced such that the end of the rebar can be inserted into the coupler, and therefore the end of the rebar is subjected to a swaging process in which the end of the rebar is pressed.

Conventionally, in the swaging process in which the end of the steel bar is pressed using the press, an operator rotates the steel bar in the state in which the end of the steel bar is disposed in the press by insertion.

In this case, however, a person rotates a large number of steel bars while holding the steel bars during the process of pressing the steel bars, whereby there is a problem that the rate of rotation of the steel bars is not constant.

In addition, since the person holds the steel bar, the force with which the steel bar is held is limited, whereby there is another problem that the end of the steel bar cannot be accurately pressed.

Furthermore, if the operator stands in front of the press while holding the steel bar during the process of gripping and pressing the steel bar using the press, there is a further problem that the operator may be impacted by the steel bar due to deformation force of the steel bar.

SUMMARY OF THE INVENTION

The present invention has been made in view of the above problems, and it is an object of the present invention to provide a steel bar gripping apparatus capable of gripping a steel bar with respect to a press that presses an end of the steel bar and rotating the steel bar to change the position of the end of the steel bar to be pressed.

In accordance with the present invention, the above and other objects can be accomplished by the provision of a steel bar gripping apparatus including a main frame having a pair of frame members fixed in a state of being spaced apart from each other by a predetermined distance, a gripping unit at least partially disposed between the pair of frame members, the gripping unit having a through-hole, through which a steel bar passes, formed therein, the gripping unit being configured to selectively perform a contraction motion in which, when the steel bar is inserted through the through-hole, the inner diameter of the through-hole is reduced, whereby the gripping unit grips an outer surface of the steel bar, and a separation

motion in which the gripping unit is separated from the outer surface of the steel bar in order to release the steel bar, a gripping unit actuator unit configured to transmit driving force to the gripping unit, and a gripping unit rotation unit configured to rotate the gripping unit, which has gripped the outer surface of the steel bar, by a predetermined angle about an axial direction of the through-hole.

The gripping unit may include a plurality of gripping piece members disposed as divided members at an outer circumference of the through-hole, an elastic member disposed parallel to an outer circumference surface of the through-hole between adjacent gripping piece members, a gripping piece receiving member configured to at least partially receive one side of each gripping piece member, and a gripping piece driving member configured to axially slide with respect to the other side of the gripping piece member.

The gripping piece member may include an inner surface facing the through-hole and an outer surface disposed opposite the inner surface in a radial direction, the outer surface having a pair of inclined surfaces reversely inclined from each other in the axial direction, the inclined surfaces being formed so as to taper from the outer face of the gripping piece member in a direction from an axial middle portion to opposite ends of the gripping piece member.

The gripping piece receiving member may have a receiving

member inner surface inclined so as to correspond to the inclined surface of the one side of the gripping piece member.

The gripping piece driving member may have a driving member inner surface inclined so as to correspond to the inclined surface of the other side of the gripping piece member.

The gripping unit actuator unit may axially drive the gripping piece driving member in a direction toward the gripping piece member or in a direction away from the gripping piece member.

The gripping unit actuator unit may include a gripping unit actuator configured to generate driving force necessary to drive the gripping piece driving member, the gripping unit actuator having a driving rod, a driving extension portion axially extending and connected to the gripping piece driving member, and a connecting plate configured to connect an end of the driving rod and the driving extension portion to each other.

The gripping piece member may further include a gripping pad removably attached to the inner surface.

The steel bar gripping apparatus may include a support frame disposed under the main frame, wherein the support frame may include a panel assembly having a pair of axial panels disposed parallel to the axial direction, the axial panels being spaced apart from each other, and a transverse panel

disposed perpendicular to the axial direction, an elastic return member having an end in contact with the transverse panel, the elastic return member being configured to cause axial return motion of the panel assembly, a plurality of first guide members installed on outer faces of the axial panels, the first guide members being configured to guide the movement of the axial panels, and an axial cover having a second guide member disposed parallel to the axial panels so as to be spaced apart therefrom, the second guide member being slidable relative to the first guide members.

The gripping unit rotation unit may include a rotary actuator configured to generate rotational force necessary to rotate the gripping unit, a power transmission belt configured to transmit the rotational force between a rotary motion transmission portion of the gripping unit and the rotary actuator, and a position controller configured to control the position of the part of the power transmission belt in contact with a rotating shaft of the rotary actuator in order to adjust tension of the power transmission belt.

The rotary actuator may apply the rotational force to the gripping unit while the gripping unit is gripping the outer surface of the steel bar.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and other

advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a separated perspective view showing that ends
5 of steel bars are inserted into a conventional coupler for steel bar extension;

FIG. 2 is a conceptual view showing the entirety of a steel bar swaging system including a steel bar gripping apparatus according to an embodiment of the present invention;

10 FIG. 3 is a separated side view showing the steel bar gripping apparatus according to the embodiment of the present invention, from which an axial cover of a support frame is separated;

FIG. 4 is a separated front view showing the steel bar
15 gripping apparatus of FIG. 3, from which a transverse panel of the support frame is separated; and

FIG. 5 is a view showing that an elastic member is connected between adjacent gripping piece members of the steel bar gripping apparatus according to the embodiment of the
20 present invention.

DETAILED DESCRIPTION OF THE INVENTION

Hereinafter, embodiments of the present invention will be described with reference to the accompanying drawings.
25 The following description and the accompanying drawings are

provided to illustrate the operation of the present invention, and parts that can be readily implemented by those skilled in the art may be omitted.

In addition, the specification and the drawings are not provided to limit the present invention, and the scope of the present invention must be limited by the claims. The terms used in the specification are to be construed in a manner consistent with the technical idea of the invention so as to most appropriately express the present invention.

FIG. 2 shows a steel bar swaging system including a steel bar gripping apparatus according to an embodiment of the present invention. Referring to the figure, the steel bar swaging system includes a steel bar supply apparatus 200 configured to individually supply long steel bars at predetermined points in time, a steel bar gripping apparatus 100 according to an embodiment of the present invention, and a steel bar press apparatus 300 configured to swage the end of a steel bar supplied thereto.

The steel bar supply apparatus 200 supplies a long steel bar B to the steel bar press apparatus 300 through a through-hole 122 (see FIG. 5) of the steel bar gripping apparatus 100.

A conventional known steel bar supply apparatus and a conventional steel bar press apparatus may be used as the steel bar supply apparatus 200 and the steel bar press

apparatus 300, respectively. Consequently, the steel bar gripping apparatus 100 according to the present invention is operated with the conventional steel bar supply apparatus 200 and the conventional steel bar press apparatus 300 to constitute the steel bar swaging system. To this end, the steel bar gripping apparatus 100 according to the present invention is aligned with the steel bar supply apparatus 200 and the steel bar press apparatus 300 such that the steel bar B supplied by the steel bar supply apparatus 200 can be inserted into a predetermined position of the steel bar press apparatus 300 through the steel bar gripping apparatus 100.

The steel bar gripping apparatus 100 according to the embodiment of the present invention appropriately grips an outer surface S of the steel bar B inserted through the through-hole thereof while the steel bar press apparatus 300 is swaging the end of the steel bar. In addition, the steel bar gripping apparatus 100 grips the steel bar while rotating the steel bar by a predetermined angle such that the entirety of an outer circumferential surface of the end of the steel bar is evenly swaged.

Meanwhile, when the end of the steel bar is swaged by the steel bar press apparatus 300, the steel bar is not only subjected to compression force in a radial direction but also subjected to force in an axial direction, whereby the steel bar is pushed in the axial direction. The steel bar gripping

apparatus 100 according to the present invention slides the steel bar in the axial direction to accept the axial force when the steel bar is pushed in the axial direction by the steel bar press apparatus 300, thereby preventing a phenomenon
5 in which the steel bar is bent.

FIG. 3 is a separated side view showing the steel bar gripping apparatus according to the embodiment of the present invention, from which an axial cover of a support frame is separated, and FIG. 4 is a separated front view showing the
10 steel bar gripping apparatus of FIG. 3, from which a transverse panel of the support frame is separated.

Referring to FIGs. 3 and 4, the steel bar gripping apparatus 100 according to the embodiment of the present invention includes a main frame 110 having a pair of frame
15 members 112 and 114 fixed in a state of being spaced apart from each other by a predetermined distance. Here, the direction in which the first frame member 112 and the second frame member 114 are spaced apart from each other is the direction in which the steel bar extends, which corresponds
20 to a +x/-x direction in the figures.

Meanwhile, the steel bar gripping apparatus 100 according to the embodiment of the present invention includes a gripping unit 12 at least partially disposed between the pair of frame members 112 and 114, the gripping unit having
25 a through-hole 122 (see FIG. 5), through which the steel bar

B (see FIG. 2) can pass, formed therein.

The gripping unit 120 is configured to selectively perform a contraction motion in which, when the steel bar is inserted through the through-hole defined by the gripping unit, the inner diameter of the through-hole defined by the gripping unit is reduced, whereby the gripping unit grips the outer surface S of the steel bar, and a separation motion in which the gripping unit is separated from the outer surface of the steel bar in order to release the steel bar.

In addition, the steel bar gripping apparatus 100 according to the embodiment of the present invention includes a gripping unit actuator unit 130 configured to transmit driving force to the gripping unit 120. The contraction motion and the separation motion of the gripping unit 120 are performed by the driving force transmitted by the gripping unit actuator unit 130.

The steel bar gripping apparatus 100 according to the embodiment of the present invention includes a gripping unit rotation unit 140 configured to rotate the gripping unit 120, which has gripped the outer surface S of the steel bar B, by a predetermined angle about an axial direction of the through-hole 122. The gripping unit rotation unit 140 intermittently rotates the steel bar B in a state of being gripped by the gripping unit 120 by a predetermined angle, for example, an angle of 20 degrees, whereby the outer circumferential surface

of the end of the steel bar is substantially uniformly swaged
by the steel bar press apparatus 300.

FIG. 5 is a view showing that an elastic member is
connected between adjacent gripping piece members of the steel
5 bar gripping apparatus according to the embodiment of the
present invention.

Referring to FIGs. 3, 4, and 5, the gripping unit 120,
at least a part of which is disposed between the pair of frame
members 112 and 114, includes a plurality of gripping piece
10 members 124 disposed as divided members at the outer
circumference of the through-hole 122 and an elastic member
125 disposed parallel to the outer circumference surface of
the through-hole 122 between adjacent gripping piece members.

In addition, the gripping unit 120 includes a gripping
15 piece receiving member 126 configured to at least partially
receive one side of the gripping piece member 124 and a
gripping piece driving member 128 configured to axially slide
with respect to the other side of the gripping piece member
124.

20 Referring to FIG. 5, the gripping piece member 124
includes an inner surface 124i facing the through-hole 122,
which extends in the axial direction, and an outer surface
124e disposed opposite the inner surface in the radial
direction, the outer surface 124e having a pair of inclined
25 surfaces 124c1 and 124c2 reversely inclined from each other

in the axial direction.

The inclined surfaces 124c1 and 124c2 are formed so as to taper from the outer face of the gripping piece member 124 in a direction from an axial middle portion 124m to opposite
5 ends 124t of the gripping piece member 124.

As shown in FIG. 5, the thickness of the gripping piece member 124 is greatest at the axial middle portion 124m, and the thickness of the gripping piece member 124 gradually decreases toward the opposite ends 124t of the gripping piece
10 member 124.

For example, six or eight gripping piece members 124 may be spaced apart from each other along the circumference of the through-hole 122. FIG. 5 illustratively shows only two adjacent gripping piece members 124. Elastic member
15 receiving recesses 124g, in which the ends of the elastic member 125 are received, are formed in side surfaces 124s of the adjacent gripping piece members 124 so as to correspond to each other.

Two elastic member receiving recesses 124g are formed
20 in one side surface 124s so as to correspond to the pair of inclined surfaces 124c1 and 124c2, respectively. As shown in FIG. 5, therefore, two elastic members 125 may be disposed between two adjacent gripping piece members 124.

The elastic member 125 serves to secure a
25 circumferential gap between two adjacent gripping piece

members 124. That is, when the gripping unit 120 performs a contraction motion, the distance between adjacent gripping piece members 124 is decreased. In this case, the elastic member 125 is compressed to push the gripping piece members 124 in order to maintain the distance between the two adjacent gripping piece members 124 by a predetermined spring constant.

The distance between the two adjacent gripping piece members 124 is increased again due to the pushing action of the elastic member 125, and in this process, the gripping unit 120 performs a separation motion.

Next, the contraction motion of the gripping unit 120 will be described.

Referring to FIGs. 3 and 5, the gripping piece receiving member 126 has a receiving member inner surface 126i inclined so as to correspond to the inclined surface 124c1 of one side of the gripping piece member 124.

In addition, the gripping piece driving member 128 has a driving member inner surface 128i inclined so as to correspond to the inclined surface 124c2 of the other side of the gripping piece member 124.

Here, the gripping unit actuator unit 130 axially drives the gripping piece driving member 128 in a direction toward the gripping piece member 124 (+x direction) or in a direction away from the gripping piece member 124 (-x direction).

Referring to FIGs. 3 and 4, in order for the gripping

unit actuator unit 130 to perform the above driving operation,
the gripping unit actuator unit 130 includes a gripping unit
actuator 132 configured to generate driving force necessary
to drive the gripping piece driving member 128, the gripping
5 unit actuator 132 having a driving rod 133, a driving
extension portion 134 axially extending and connected to the
gripping piece driving member 128, and a connecting plate 136
configured to connect an end 133T of the driving rod 133 and
the driving extension portion 134 to each other.

10 The gripping unit actuator 132 may be, for example, a
pneumatic cylinder or a hydraulic cylinder. Although not
shown in the figures, a control unit (not shown) controls the
point in time at which the gripping unit actuator 132 is
operated.

15 When the driving rod 133 is contracted in the +x
direction by the operation of the gripping unit actuator 132,
the connection plate 136 connected to the driving rod 133 is
also moved in the +x direction, and the driving extension
portion connected to the connection plate 136 is also moved
20 in the +x direction, whereby the gripping piece driving member
128 is moved in the +x direction.

 As the gripping piece driving member 128 is moved in
the +x direction, the inclined driving member inner surface
128i of the gripping piece driving member 128 comes into
25 contact with the inclined surface 124c1 of the other side of

the gripping piece member 124, and the inclined surface 124c2 of one side of the gripping piece member comes into contact with the inner surface 126i of the gripping piece receiving member 126.

5 When the driving extension portion 134 is further moved in the +x direction in this state, the gripping piece driving member 128 further pushes the gripping piece member 124 in the +x direction, and the inclined surfaces 124c1 and 124c2 of the individual gripping piece members 124 are moved
10 inwardly of the through-hole reference radius along the inclined inner surface 128i of the gripping piece driving member 128 and the inclined inner surface 126i of the gripping piece receiving member 126, whereby a contraction motion is performed.

15 When the gripping piece member 124 comes into contact with the outer surface of the steel bar B during the contraction motion, the gripping piece member 124 of the gripping unit 120 firmly grips the steel bar B.

 Next, the separation motion of the gripping unit 120
20 will be described.

 When the driving rod 133 is extended in the -x direction by the operation of the gripping unit actuator 132, the connection plate 136 connected to the driving rod 133 is also moved in the -x direction, and the driving extension portion
25 connected to the connection plate 136 is also moved in the -

x direction, whereby the gripping piece driving member 128 is moved in the -x direction.

As the gripping piece driving member 128 is moved in the -x direction, the inclined driving member inner surface 128i of the gripping piece driving member 128 starts to be separated from the inclined surface 124c1 of the other side of the gripping piece member 124, and the inclined surface 124c2 of one side of the gripping piece member also starts to be separated from the inclined surface 126i of the gripping piece receiving member 126.

In this process, the distance between the gripping piece members 124 is increased by the pushing action of the elastic member 125 disposed between adjacent gripping piece members 124, whereby the gripping piece members are also moved radially outwardly relative to the through hole.

When the driving extension portion 134 further moves in the -x direction in this state, the gripping piece members 124 further pushes the gripping piece driving member 128 in the -x direction due to the elastic action of the elastic member 125 disposed between adjacent gripping piece members 124.

The gripping piece driving member 128 is moved in the -x direction by the driving force of the gripping unit actuator unit 130 in the -x direction, and at the same time, the individual gripping piece members 124 are moved outwardly

in the radial direction by the elastic push action of the elastic member 125, whereby the diameter of the through-hole 122 defined by the gripping piece members 124 is increased, and eventually the gripping unit 120 is separated from the outer surface of the steel bar.

The contraction motion of the gripping unit 120 is continuously performed in the state in which it is necessary to grip the steel bar, and the separation motion of the gripping unit 120 is performed in the state in which it is necessary to release the state in which the steel bar is gripped.

Meanwhile, the second frame member 114 is provided with a steel bar anti-sagging unit 160 configured to prevent the steel bar from sagging.

The steel bar anti-sagging unit 160 is installed in a direction toward the steel bar press apparatus 300. Specifically, the steel bar anti-sagging unit 160 includes a support rod 160b extending from the second frame member 114 and a support plate 160a disposed at an end of the support rod, the support plate 160a having a through-hole, through which the steel bar passes.

Since the support plate 160a supports the end of the steel bar thereunder, a phenomenon in which the end of the steel bar excessively sags in a direction toward the ground due to the weight thereof is prevented, and therefore the end

of the steel bar can be aligned and inserted into the steel bar press apparatus 300.

Meanwhile, referring to FIG. 5, the gripping piece member 124 further includes a gripping pad 124p removably attached to the inner surface 124i. That is, the outer surface S of the steel bar B is in direct contact with the gripping pad 124p. Since the gripping pad 124p is removably attached to the inner surface of the gripping piece member 124, only the gripping pad may be replaced when the gripping pad is worn out by frequent contact with the steel bar.

An imaginary circle defined by the gripping pad 124p becomes a contact inner surface that comes into contact with the outer surface of an actual steel bar and is defined as the through-hole 122.

The gripping unit rotation unit 140 will be described with reference to FIGS. 3 and 4. The gripping unit rotation unit 140 includes a rotary actuator 142 configured to generate rotational force necessary to rotate the gripping unit 120 and a power transmission belt 144 configured to transmit the rotational force between a rotary motion transmission portion 129 of the gripping unit 120 and the rotary actuator 142. The rotary actuator 142 may be an electric motor.

As shown in FIGs. 3 and 4, the rotary actuator 142 is disposed under the gripping unit 120.

In addition, the gripping unit rotation unit 140 further

includes a position controller 146 configured to control the position of the part of the power transmission belt 144 in contact with a rotating shaft 142s of the rotary actuator 142 in order to adjust the tension of the power transmission belt 144. The position controller 146 may be an optional recess configured to adjust the position of the rotating shaft 142s of the rotary actuator 142.

The rotary actuator 142 applies rotational force to the gripping unit while the gripping unit 120 is gripping the outer surface of the steel bar. Consequently, the steel bar gripping apparatus 100 according to the embodiment of the present invention intermittently rotates the steel bar by a predetermined angle, for example, 20 degrees, while gripping the steel bar, wherein the outer circumferential surface of the end of the steel bar is uniformly swaged by the steel bar press apparatus 300 during the time between rotations.

Referring to FIGs. 3 and 4, the steel bar gripping apparatus 100 according to the embodiment of the present invention includes a support frame 150 disposed under the main frame 110.

The support frame 150 includes a panel assembly 153 having a pair of axial panels 152a and 152b disposed parallel to the axial direction, the axial panels 152a and 152b being spaced apart from each other, and a transverse panel 154a disposed perpendicular to the axial direction.

In addition, the support frame 150 further includes an elastic return member 156 having an end in contact with the transverse panel 154a to cause axial return motion of the panel assembly, a plurality of first guide members 158a installed on outer faces of the axial panels 152a and 152b to guide the movement of the axial panels, and axial covers 159a and 159b having a second guide member 158b disposed parallel to the axial panels 152a and 152b so as to be spaced apart therefrom, the second guide member 158b being slidable relative to the first guide members.

The elastic return member 156 includes an elastic member, such as a coil spring 156a, and a spring guide rod 156b extending through an inner space of the coil spring, the spring guide rod 156b being configured to prevent buckling of the coil spring 156a.

Since the support frame 150 is connected and fixed to the main frame 110, the axial movement of the main frame 110 causes the axial movement of the support frame 150. At this time, when the support frame 150 is axially moved in the +x direction, the support frame 150 is axially moved in the -x direction again due to elastic force of the elastic return member 156, whereby the axial movement is absorbed and accepted.

In particular, it is important to absorb and accept the axial movement of the main frame 110. The reason for this is

that axial force is applied to the steel bar during swaging of the steel bar press apparatus 300, and if the axial force applied to the steel bar is not dissipated, absorbed, and accepted, the steel bar may be bent.

5 In the steel bar gripping apparatus 100 according to the embodiment of the present invention, the main frame 110 and the support frame 150 located thereunder absorb and accept the stress applied to the steel bar in the axial direction to the elastic action of the elastic return member 156, whereby
10 it is possible to prevent deformation of the steel bar.

 Meanwhile, a sensor 170 configured to detect whether the steel bar has been inserted is disposed above the first frame member 112 of the main frame 110, and operation of the sensor is linked to the operation of the gripping unit
15 actuator unit 130.

 According to the present invention with the above configuration, in a process of pressing a large number of steel bars, the rotation of the steel bars is constant, whereby uniformity of pressing positions is improved.

20 In addition, according to the present invention, the force with which the steel bar is gripped is increased, and constant gripping force is applied to the steel bar with respect to the force applied to the press, whereby the end of the steel bar can be accurately pressed.

25 In addition, according to the present invention, it is

possible to solve the problem that, when an operator stands in front of the press while holding the steel bar during the process of gripping and pressing the steel bar using the press, the operator may be impacted by the steel bar due to deformation force of the steel bar.

In addition, according to the present invention, it is possible to continuously perform a swaging process in which ends of a large number of steel bars are pressed, whereby it is possible to improve productivity per unit time.

In addition, according to the present invention, it is possible to control the intensity of rotational force applied to the steel bar in the state in which the steel bar is gripped, whereby it is possible to press the steel bar while rotating the steel bar with higher precision.

In addition, according to the present invention, it is possible to control the force with which the steel bar is gripped depending on different diameters of the steel bar, whereby application to various steel bars is possible.

In addition, according to the present invention, it is possible to grip the steel bar while accepting the axial movement of the steel bar in which the steel bar is pushed in an axial direction during pressing of the steel bar.

Although specific embodiments of the present invention have been described above, the present invention is not limited thereto, and various modifications may be practiced

by those skilled in the art to which the present invention
pertains, and such modifications are within the scope of the
present invention.

5 With respect to interpretation, it will be understood
that the present invention may be implemented in modified
forms without departing from the essential characteristics of
the present invention.

10 The disclosed embodiments must be considered from an
illustrative, not a limiting perspective. The scope of the
present invention is set forth in the claims, not in the above
description, and any differences within the scope of
equivalents must be construed as being included in the present
invention.

15 If a term is not specifically defined in the present
invention, it should be construed broadly in its ordinary
sense and to include other terms of equal scope.

WHAT IS CLAIMED IS:

1. A steel bar gripping apparatus comprising:

5 a main frame having a pair of frame members fixed in a state of being spaced apart from each other by a predetermined distance;

10 a gripping unit at least partially disposed between the pair of frame members, the gripping unit having a through-hole, through which a steel bar passes, formed therein, the gripping unit being configured to selectively perform a contraction motion in which, when the steel bar is inserted through the through-hole, an inner diameter of the through-hole is reduced, whereby the gripping unit grips an outer surface of the steel bar, and a separation motion in which
15 the gripping unit is separated from the outer surface of the steel bar in order to release the steel bar;

a gripping unit actuator unit configured to transmit driving force to the gripping unit; and

20 a gripping unit rotation unit configured to rotate the gripping unit, which has gripped the outer surface of the steel bar, by a predetermined angle about an axial direction of the through-hole.

2. The steel bar gripping apparatus according to claim
25 1, wherein the gripping unit comprises:

a plurality of gripping piece members disposed as divided members at an outer circumference of the through-hole;

an elastic member disposed parallel to an outer circumference surface of the through-hole between adjacent gripping piece members;

a gripping piece receiving member configured to at least partially receive one side of each gripping piece member; and

a gripping piece driving member configured to axially slide with respect to the other side of the gripping piece member.

3. The steel bar gripping apparatus according to claim 2, wherein the gripping piece member comprises an inner surface facing the through-hole and an outer surface disposed opposite the inner surface in a radial direction, the outer surface having a pair of inclined surfaces reversely inclined from each other in the axial direction, the inclined surfaces being formed so as to taper from the outer face of the gripping piece member in a direction from an axial middle portion to opposite ends of the gripping piece member.

4. The steel bar gripping apparatus according to claim 3, wherein the gripping piece receiving member has a receiving member inner surface inclined so as to correspond to the

inclined surface of the one side of the gripping piece member.

5 5. The steel bar gripping apparatus according to claim
4, wherein the gripping piece driving member has a driving
member inner surface inclined so as to correspond to the
inclined surface of the other side of the gripping piece
member.

10 6. The steel bar gripping apparatus according to claim
2, wherein the gripping unit actuator unit axially drives the
gripping piece driving member in a direction toward the
gripping piece member or in a direction away from the gripping
piece member.

15 7. The steel bar gripping apparatus according to claim
6, wherein the gripping unit actuator unit comprises:

 a gripping unit actuator configured to generate driving
force necessary to drive the gripping piece driving member,
the gripping unit actuator having a driving rod;

20 a driving extension portion axially extending and
connected to the gripping piece driving member; and

 a connecting plate configured to connect an end of the
driving rod and the driving extension portion to each other.

25 8. The steel bar gripping apparatus according to claim

3, wherein the gripping piece member further comprises a gripping pad removably attached to the inner surface.

9. The steel bar gripping apparatus according to claim 1, comprising:

a support frame disposed under the main frame, wherein the support frame comprises:

a panel assembly having a pair of axial panels disposed parallel to the axial direction, the axial panels being spaced apart from each other, and a transverse panel disposed perpendicular to the axial direction;

an elastic return member having an end in contact with the transverse panel, the elastic return member being configured to cause axial return motion of the panel assembly;

a plurality of first guide members installed on outer faces of the axial panels, the first guide members being configured to guide movement of the axial panels; and

an axial cover having a second guide member disposed parallel to the axial panels so as to be spaced apart therefrom, the second guide member being slidable relative to the first guide members.

10. The steel bar gripping apparatus according to claim 1, wherein the gripping unit rotation unit comprises:

a rotary actuator configured to generate rotational

force necessary to rotate the gripping unit;

a power transmission belt configured to transmit the rotational force between a rotary motion transmission portion of the gripping unit and the rotary actuator; and

5 a position controller configured to control a position of a part of the power transmission belt in contact with a rotating shaft of the rotary actuator in order to adjust tension of the power transmission belt.

10 11. The steel bar gripping apparatus according to claim 10, wherein the rotary actuator applies the rotational force to the gripping unit while the gripping unit is gripping the outer surface of the steel bar.