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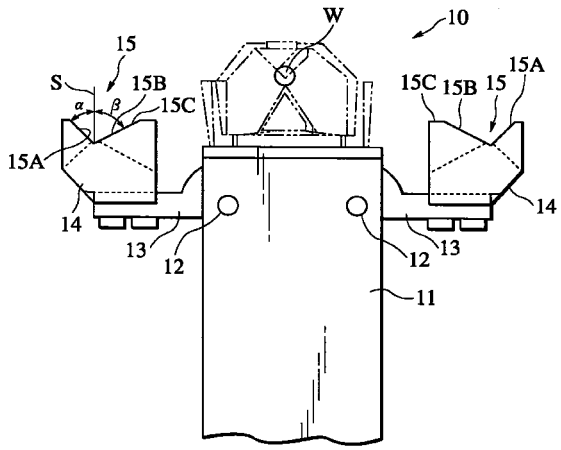
(54) Electric wire grasping clamp

(57) There is provided a support block; one pair of grasping blocks which have sandwich faces for sandwiching an electric wire (W) between in a predetermined position and which are supported by the support block so as to be freely rotatable between the position for sandwiching the electric wire and at least a horizontal position; and grasping concave portions which are provided in the sandwich faces, and each of which has two contact faces coming into contact with outer periphery of the electric wire.

An angle formed between one contact face located on a rotation center side in the grasping block when the grasping block is in a horizontal position state and a perpendicular line is set so as to be larger than an angle formed between the other contact face and the perpendicular line, and consequently the electric wire is located so as to have same axis height irrespective of a diameter of the electric wire.

FIG.1



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an electric wire grasping clamp, and in particular to an electric wire grasping clamp used in a machine for conducting cutting working on electric wires which form a wire harness.

2. Related Art

[0002] As for conventional electric wire grasping clamps, a plurality of electric wiring grasping clamps are fixed to a chain, and conveyance is conducted in such a state that each of electric wiring grasping clamps grasps an electric wire W. The chain is moved in such a state a pair of conveyance claws grasp an electric wire W. By releasing the conveyance claws, the electric wire W is fed to a production receiver. On respective faces of a pair of conveyance claws for grasping the electric wire W, concave portions having curved faces corresponding to the peripheral face of the electric wire W are formed. After releasing the electric wire W from the conveyance claws, the electric wire grasping clamp moves in a loop form, returns to the original position, and grasps the electric wire W again.

SUMMARY OF THE INVENTION

[0003] If the above described electric wire grasping clamp is to carry an electric wire having a different diameter dimension, however, then the size of the concave portions of the conveyance claws needs to be changed according to the electric wire, and consequently the conveyance claws themselves need to be replaced. Furthermore, since the chain for conveyance is used, the number of components is large resulting in a high cost and ricketiness is apt to occur.

[0004] Therefore, an object of the present invention is to provide an electric wire grasping clamp which is adapted to be able to grasp an electric wire having a different diameter dimension and which is adapted to cause no shift in center axis between grasped electric wires having different diameter dimensions.

[0005] To achieve the object, from a first aspect of an invention, there is provided an electric wire grasping clamp comprising: a support block; one pair of grasping blocks which have sandwich faces for sandwiching an electric wire (W) between in a predetermined position, and which are supported by the support block so as to be freely rotatable between the position for sandwiching the electric wire and at least a horizontal position; and grasping concave portions which are provided in the sandwich faces, and each of which has two contact faces coming into contact with outer periphery of the electric wire.

[0006] An angle formed between one contact face located on a rotation center side in the grasping block when the grasping block is in a horizontal position state and a perpendicular line is set so as to be larger than an angle formed between the other contact face and the perpendicular line, and consequently the electric wire is located so as to have same axis height irrespective of a diameter of the electric wire.

[0007] Therefore, an angle formed between one contact face located on a rotation center side of the grasping block in a horizontal position and a perpendicular line is set so as to be larger than an angle formed between the other contact face and the perpendicular line. When grasping an electric wire of a different diameter dimension, therefore, it is possible to prevent the central axis of the electric wire from being shifted. Furthermore, when grasping an electric wire, it is possible to prevent a part of one contact face from striking against the electric wire due to the rotation of the grasping blocks.

[0008] Preferably, the one pair of grasping blocks are fixed to one pair of rotary arms, and the one pair of rotary arms are supported by the support block in rotation centers provided in different positions of the support block, so as to be freely rotatable.

[0009] In the present invention, grasping blocks are rotated around rotation centers provided in different positions. When grasping an electric wire of a different diameter dimension, therefore, it is possible to prevent the central axis of the electric wire W brought into contact with one contact face and the other contact face of a grasping concave portion from being shifted due to the difference in diameter dimension.

[0010] Preferably, the support block moves in a horizontal direction while grasping the electric wire, conveys the electric wire, thereafter assumes a horizontal position, and returns to the original position.

[0011] In the present invention, the support block supporting the grasping blocks moves in a horizontal direction, and consequently the electric wire grasped by the grasping blocks is conveyed in the horizontal direction. Furthermore, after the electric wire has been conveyed, the support block returns to the original position. Therefore, it becomes possible to convey an electric wire again. Electric wires can thus be conveyed one after another.

[0012] Preferably, each of the grasping blocks is formed of a plurality of grasping pieces disposed like a comb, and grasping pieces of one of the grasping blocks can be inserted in grasping pieces of the other of the grasping blocks.

[0013] In the present invention, each grasping block is formed of a plurality of grasping pieces. Between grasping pieces, a gap is formed. The grasping pieces are formed like a comb so that grasping pieces of the other grasping block may be inserted in the gaps. When an electric wire is to be sandwiched between one pair of

grasping blocks, therefore, contact faces of the grasping blocks can be made to get closer so as to sandwich the electric wire between the them.

[0014] From a second aspect of the invention, there is provided an electric wire grasping clamp comprising: a grasping block which has a first face and a second face to keep an electric wire threrebetween. The first face has a first angle relative to a perpendicular line. The second face has a second angle relative to the perpendicular line. The first angle is different from the second angel.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

FIG. 1 is a side view showing an embodiment of an electric wire grasping clamp according to the present invention;

FIG. 2A is a perspective view showing a state in which a grasping block of an electric wire grasping clamp of the embodiment;

FIG. 2B is a perspective view showing a state in which grasping is conducted by using the grasping block;

FIG. 3 is a diagram for description showing a state in which an electric wire having a different diameter dimension;

FIG. 4 is a diagram for description showing a state in which an electric wire having a different diameter dimension is grasped in a comparative example;

FIG. 5 is a side view showing an electric wire grasping clamp of the comparative example;

FIG. 6 is a top view of an automatic cutting and pressure connection apparatus using an electric wire grasping clamp of the embodiment;

FIG. 7 is a side view showing a conveyance portion in the automatic cutting and pressure connection apparatus using the electric wire grasping clamp of the embodiment; and

FIG. 8 is a plan view showing the conveyance portion in the automatic cutting and pressure connection apparatus using the electric wire grasping clamp of the embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] Hereafter, details of an electric wire grasping clamp according to the present invention will be described by referring to an embodiment shown in FIGS. 1 to 3.

[0017] Roughly speaking, an electric wire grasping clamp 10 of the present embodiment includes a pair of rotary arms 13 each having a shaft supported by a support block 11 so as to be rotatable, and grasping blocks 14 fixed to respective rotary arms 13, as shown in FIG. 1.

[0018] In the present embodiment, the rotary arms 13 are respectively supported by parallel rotary shafts 12 and 12 disposed, on an upper part of the support block 11 taking the shape of nearly a rectangular parallelepiped, at a predetermined interval. Each of the rotary arms 13 is stipulated so as to rotate over such a range that an angle formed between a position of a horizontal state represented by a solid line and a position of a vertical state represented by a chain line is approximately 90 degrees. The rotary arms 13 and 13 are driven so as to be rotated by a drive mechanism which is not illustrated and which conducts, for example, hydraulic drive, pneumatic drive, or electric dynamo drive. By mutual approach of the rotary arms 13 and 13, an electric wire W is grasped between the grasping blocks 14.

[0019] On faces opposed when the grasping blocks 14 approach each other, grasping concave portions 15 are formed, respectively. As shown in FIG. 1, the grasping concave portion 15 is formed of a contact face 15A forming an angle α with a perpendicular line S which in turn forms a right angle with the rotary arm 13, and a contact face 15B forming an angle β with the perpendicular line S. And the angle α and the angle β are set so as to satisfy the relation $\alpha < \beta$. In the present embodiment, the angle β is set so as to become approximately 1.5 times the angle α. Satisfying such relations, the angle α and the angle β are suitably set by giving consideration to the distance between the rotary shafts 12, and the length measured from the rotary shaft 12 to a portion where the contact faces 15A and 15B in the grasping concave portion 15 join (i.e., a bottom portion of the grasping concave portion 15).

[0020] Furthermore, the grasping block 14 includes a plurality of (three) grasping pieces 16A each having the contact face 15A and a plurality of (three) grasping pieces 16B each having the contact face 15B. These grasping pieces 16A are disposed so as to become parallel at predetermined intervals in the width direction of the grasping block 14. The grasping pieces 16B are disposed in the same way so as to corresponding to the grasping pieces 16A. In addition, the grasping blocks 14 are disposed so as to be shifted with respect to each other by a predetermined distance so that the grasping pieces 16A and 16B of one of the grasping blocks 14 may be inserted in gaps between the grasping pieces 16A and 16B of the other of the grasping blocks 14. By virtue of such a configuration, it becomes possible to bring the contact faces 15A and 15B into contact with the outer peripheral face of the electric wire W when the grasping blocks 14 get closer to each other and overlap each other. FIG. 2A shows an open state in which the grasping blocks 14 and 14 are in the horizontal position. FIG. 2B shows such a state that the rotary arms 13 are driven to be rotated and consequently the grasping blocks 14 get closer to each other and the grasping pieces 16A and 16B overlap each other.

[0021] FIG. 3 is a diagram for description showing a

state in which the electric wire grasping clamp 10 of the present embodiment grasps an electric wire W having a different diameter dimension. Even if the grasping concave portions 15 of the grasping blocks 14 grasp an electric wire W1 having a short diameter dimension and an electric wire W2 having a long diameter dimension as shown in FIG. 3, it is possible to make the central axis of the electric wire W1 coincide with the central axis of the electric wire W2. In the case where an electric wire is conveyed by the electric wire grasping clamp 10, it becomes possible to convey an electric wire so that the central axis of the electric wire may be always positioned at the same height. In the case where an electric wire is fed and conveyed to an apparatus for attaching a metal fitting to an end portion of the electric wire, complicated work such as apparatus setting and exchange of the grasping blocks 14 becomes unnecessary and smooth work can be conducted.

[0022] With respect to the electric wire grasping clamp 10 of the present embodiment heretofore described, FIGS. 4 and 5 show a comparative example. In an electric wire grasping clamp according to this comparative example, the same components as those of the electric wire grasping clamp 10 of the present embodiment are denoted by like characters. In the electric wire grasping clamp 10 of the comparative example, both the angle formed between the contact face 15A of the grasping block 14 and the perpendicular line S, and the angle formed between the contact face 15B and the perpendicular line S are set to the same angle α as shown in FIG. 5. In the comparative example thus set, a thick electric wire W2 is to be sandwiched as shown in FIG. 4. When a rotary arm 3 is rotated and moved around a rotary shaft 12 so that a contact face 15A and a contact face 15B will contact the outer periphery of the electric wire W2, the central axis of the thick electric wire W2 moves upward as compared with when a fine electric wire W1 is sandwiched. A shift value H occurs between the central axis of the sandwiched fine electric wire W1 and the central axis of the thick electric wire. On the other hand, in the electric wire grasping clamp 10 of the present embodiment shown in FIG. 3, the angle α formed between the contact face 15A and the perpendicular line S and the angle β formed between the contact face 15B and the perpendicular line S are set so as to satisfy the relation $\beta > \alpha$. Between the central axis of the fine electric wire W1 and the central axis of the thick electric wire W2, therefore, no shift occurs.

[0023] Heretofore, the configuration of the electric wire grasping clamp 10 of the present embodiment has been described. A wire automatic cutting and pressure connection apparatus using the electric wire grasping clamp 10 of the present embodiment will now be described by referring to FIGS. 6 to 8.

[0024] FIG. 6 is a plan view showing the whole of an automatic cutting and pressure connection apparatus 20. Roughly speaking, an automatic cutting and pressure connection apparatus 20 includes an electric wire reforming portion 21 having a plurality of pairs of opposed reforming rollers 22 for reforming an electric wire W supplied from, for example, a take-up reel so as to become rectilinear, a length measuring feed portion 23 for feeding the supplied electric wire W while measuring the length thereof, a first terminal pressure connection unit 24 for pressure-connecting a terminal metal fitting on a terminal of the electric wire, a cutting and covering stripping portion 25 for cutting the electric wire W fed from the and stripping insulation covering fed from the length measuring feed portion 23, a revolution portion 26 for moving the terminal of the electric wire with the insulation covering stripped to the first terminal pressure connection unit 24, a conveyance portion 27 for conveying the electric wire W having a predetermined length cut and fed by the cutting and covering stripping portion 25 while grasping an end portion of this side of the electric wire W, a second terminal pressure connection unit 28 for pressure-connecting a terminal metal fitting on a terminal of the electric wire W carried by the conveyance portion 27, and an electric wire feeding portion 29 for feeding the electric wire W having the terminal attached by the second terminal pressure connection unit 28.

[0025] The electric wire W supplied from a take-up reel, which is not illustrated, passes between the reforming rollers 22 to 22 of the electric wire reforming portion 21 along a y direction indicated by an illustrated arrow. By being bent between the reforming rollers 22, the electric wire is reformed so as to become rectilinear. The electric wire W passed through the electric wire reforming portion 21 is adapted to be fed by a feed length preset in the length measuring feed portion 23. Here, in an initial stage where the electric wire W is first set, insulation covering of a tip end of the fed electric wire W is peeled off over a predetermined length range by the cutting and covering stripping portion 25. In the revolution portion 26, the electric wire is revolved with a revolution axis 26a serving as a fulcrum, by a revolution drive unit which is not illustrated. A terminal end of the electric wire W is thus moved to the first terminal pressure connection unit 24. The first terminal pressure connection unit 24 is adapted to attach a terminal metal fitting to the terminal end of the electric wire W moved by the revolution portion 26. As shown in FIG. 6, the electric wire W having the terminal metal fitting attached thereto by the first terminal pressure connection unit 24 is returned to its original position by the revolution portion 26 and disposed along the y direction. Thereafter, the electric wire W is fed by a predetermined length by the length measuring feed portion 23. Cutting of the electric wire W and peeling off of the covering are conducted by the cutting and covering stripping portion 25. The electric wire W cut off by the cutting is then conveyed toward the second terminal pressure connection unit 28 along an x direction indicated by an illustrated arrow by the conveyance portion 27.

[0026] The configuration of the conveyance portion

27 will now be described by referring to FIGS. 6 to 8. The conveyance portion 27 is disposed along the x direction which forms approximately a right angle with the feed direction of the electric wire W in the electric wire reforming portion 21, the length measuring feed portion 23, and the revolution portion 26. In this apparatus, the conveyance portion 27 has three fixed electric wire grasping clamps 10A1, 10A2 and 10A3 disposed and fixed along the x direction at equal intervals. Each of these fixed electric wire grasping clamps 10A1 to 10A3 has a configuration similar to that of the above described electric wire grasping clamp 10 of the embodiment. A support block 11 having a pair of grasping blocks 14 and 14 is fixed to an apparatus main body side, which is not illustrated, of this automatic cutting and pressure connection apparatus 20.

[0027] Furthermore, side by side with the fixed electric wire grasping clamps 10A1 to 10A3 thus disposed, a conveyance frame 30 is disposed along the conveyance direction. This conveyance frame 30 is fixed to a piston rod 32, which is driven to reciprocate by a reciprocating drive cylinder 31 fixed to the apparatus main body side, via a coupling member 33. In FIGS. 6 to 8, numeral 34 denotes a stopper for regulating the projection of the piston rod 32 which exceeds a predetermined length.

[0028] To faces of the conveyance frame 30 opposed to the fixed electric wire grasping clamps 10A1 to 10A3, four electric wire grasping clamps 10B1 to 10B4 for conveyance are successively fixed along the conveyance direction. By the way, the electric wire grasping clamps 10B1 to 10B4 for conveyance are set so as to have the same interval as that of the fixed electric wire grasping clamps 10A1 to 10A3. Furthermore, the electric wire grasping clamps 10B1 to 10B4 for conveyance are set to the same height as that of the fixed electric wire grasping clamps 10A1 to 10A3.

[0029] Among these electric wire grasping clamps 10B1 to 10B4 for conveyance, the electric wire grasping clamp 10B1 for conveyance located the nearest to the cutting and covering stripping portion 25 is set in such a position as to be able to sandwich the electric wire W (hereafter referred to as first position) in a passing path of the electric wire W in the cutting and covering stripping portion 25 in such a state that the piston rod 32 is projected the most from the reciprocating drive cylinder 31. In other words, the electric wire W cut by the cutting and covering stripping portion 25 and having a terminal metal fitting attached thereto by the first terminal pressure connection unit 24 is subjected to cutting and covering peel off in such a state that the electric wire W is fed by a predetermined length. The electric wire grasping clamp 10B1 for conveyance located in the first position is disposed so as to be able to grasp an end portion of this side of the electric wire W cut off by this cutting. (A terminal metal fitting is not attached to this end portion.) The stroke of the piston rod 32 of the reciprocating drive cylinder 31 is set so as to corresponding to the interval of the electric wire grasping clamps 10B1 to 10B4 for conveyance.

[0030] As shown in FIG. 8, therefore, the electric wire grasping clamps 10B1 to 10B4 for conveyance repeat reciprocating operation so that the electric wire grasping clamp 10B1 will move to the position of the fixed electric wire grasping clamp 10A1 (hereafter referred to as second position) and return to the first position. In the same way, other electric wire grasping clamps 10B1 to 10B4 for conveyance also conducts reciprocating operation corresponding to the interval of the fixed electric wire grasping clamps 10A1 to 10A3 (which is equal to the interval of the electric wire grasping clamps 10B1 to 10B4 for conveyance as well). By the way, a position of the fixed electric wire grasping clamp 10A2 is defined as a third position, and a position of the fixed electric wire grasping clamp 10A3 is defined as a fourth position. A position to which the electric wire grasping clamp 10B4 moves when the piston rod 32 moves in the conveyance direction and the projection value of the piston rod 32 from the reciprocating drive cylinder 31 becomes the shortest is defined as delivery position.

[0031] The second terminal pressure connection unit 28 is disposed at the side of the fixed electric wire grasping clamp 10A3 located in the fourth position. The second terminal pressure connection unit 28 is adapted to attach a terminal metal fitting to an end portion of the electric wire W to which a terminal metal fitting is not attached yet. Furthermore, in the delivery position, a takeout electric wire grasping clamp 10C for receiving the electric wire W is adapted to be able to be positioned. This takeout electric wire grasping clamp 10C is disposed in the electric wire feeding portion 29.

[0032] The configuration of the takeout electric wire grasping clamp 10C and the electric wire feeding portion 29 including it will now be described. As shown in FIG. 7, the takeout electric wire grasping clamp 10C has nearly the same configuration as the above described electric wire grasping clamp 10 of the present embodiment. The takeout electric wire grasping clamp 10C is different from the electric wire grasping clamp 10 in that a support shaft 41 provided integrally with a bottom portion of the support block 11 is supported in axis by the apparatus base side and the takeout electric wire grasping clamp 10C is adapted to be rotatable around the support shaft 41 serving as a rotation axis. Furthermore, a reversing gear 42 is provided integrally with the support shaft 41. A driving gear 43 is combined with the reversing gear 42 so as to engage with the reversing gear 42. A rotary shaft 44 is provided integrally with the driving gear 43. The rotary shaft 44 is supported in axis by a member of the apparatus base side. An end of a cam arm 45 is fixed integrally to the rotary shaft 44 of the driving gear 43. In an intermediate portion of the cam arm 45 located nearer to the other end thereof, an elongated guide hole 45A is formed along its longitudinal direction. A guide projection 30A formed in a prede-

termined position of an end portion of the conveyance frame 30 is fitted in the elongated guide hole 45A so as to be slidable. With the progress of the reciprocating operation of the conveyance frame 30, therefore, the cam arm 45 is adapted to be able to be rotated in the clockwise direction and counterclockwise direction in FIG. 7 while the guide projection 30A slides in the elongated guide hole 45A of the cam arm 45. In keeping with this rotation, the driving gear 43 rotates in a bi-directional manner by a predetermined angle. As a result, the reversing gear 42 engaging with the driving gear 43 is rotated in a direction opposite to that of the driving gear 43. As the reversing gear 42 rotates, the support block 11 moves between a position indicated by a chain line and the delivery position.

[0033] The function and operation of the conveyance portion 27 having such a configuration will now be described.

[0034] First of all, the end portion of this side (to which a terminal metal fitting is not attached yet) of the electric wire W cut and cut off by the cutting and covering stripping portion 25 is grasped between a pair of grasping blocks 14 of the electric wire grasping clamp 10B1 for conveyance located in the first position. Here, the projection value of the piston rod 32 of the reciprocating drive cylinder 31 is maximized. Next, in such a state that the electric wire grasping clamp 10B1 for conveyance grasps the electric wire W, the reciprocating drive cylinder 31 conducts driving so as to minimize the projection value of the piston rod 32, and thereby moves the conveyance frame 30. As a result of this movement, the electric wire grasping clamp 10B1 for conveyance moves to the second position while grasping the electric wire W. Prior to this movement of the electric wire grasping clamp 10B1 for conveyance, drive control is effected in order that a pair of grasping blocks 14 and 14 of the fixed electric wire grasping clamp 10A1 is opened. In the second position, the fixed electric wire grasping clamp 10A1 grasps the electric wire W grasped by the electric wire grasping clamp 10B1 for conveyance. A pair of grasping blocks 14 and 14 of the electric wire grasping clamp 10B1 for conveyance are then released, and the electric wire W is delivered to the fixed electric wire grasping clamp 10A1. At this time, the grasping blocks 14 and 14 of the electric wire grasping clamp 10B1 are in the open state in the horizontal direction. Therefore, the grasping blocks 14 and 14 of the electric wire grasping clamp 10B1 for conveyance are in a position lower than the height of the electric wire W grasped by the fixed electric wire grasping clamp 10A1. As a result, by maintaining this state, the electric wire grasping clamp 10B1 can return to the first position without being obstructed by the electric wire during the movement.

[0035] Subsequently, the electric wire grasping clamp 10B1 for conveyance conveys the electric wire W to the fixed electric wire grasping clamp 10A1, and returns to the first position. Thereupon, the electric wire grasping clamp 10B2 for conveyance provided on the conveyance frame 30 moves to the second position where the fixed electric wire grasping clamp 10A1 is present. The electric wire grasping clamp 10B2 for conveyance grasps the electric wire W. Thereafter, the fixed electric wire grasping clamp 10A1 releases the electric wire W, and moves the grasping blocks 14 and 14 to the horizontal state.

[0036] Subsequently, the conveyance frame 30 is driven and moves in the conveyance direction. The electric wire grasping clamp 10B2 for conveyance moves to the third position while grasping the electric wire W. The electric wire grasping clamp 10B2 for conveyance delivers the electric wire W to the fixed electric wire grasping clamp 10A2 in the same way. The electric wire W grasped by the fixed electric wire grasping clamp 10A2 is delivered to the fixed electric wire grasping clamp 10A2 located in the fourth position by the electric wire grasping clamp 10B3 for conveyance in the same way. In this fourth position, the above described second terminal pressure connection unit 28 is disposed. A terminal metal fitting is pressure-connected to an end portion of the electric wire W. The electric wire W having the terminal metal fitting thus attached thereto is conveyed to the delivery position by the electric wire grasping clamp 10B4 for conveyance. At this time, the takeout electric wire grasping clamp 10C moves to the delivery position in synchronism with the electric wire grasping clamp 10B4 for conveyance. In other words, when the electric wire grasping clamp 10B4 for conveyance moves to the delivery position, the conveyance frame 30 also moves in the same direction at the same time. Therefore, the guide projection 30A presses the cam arm 45. As a result, the driving gear 43 is driven to rotate and consequently the reversing gear 42 is rotated in the clockwise direction. As a result, the takeout electric wire grasping clamp 10C moves to the delivery position. At this time, a pair of grasping blocks 14 and 14 of the takeout electric wire grasping clamp 10C are driven to the open state as shown in FIG. 7.

[0037] And the takeout electric wire grasping clamp 10C grasps the electric wire W grasped by the electric wire grasping clamp 10B4 for conveyance located in the delivery position. Thereafter, the electric wire grasping clamp 10B4 for conveyance releases the electric wire W, and moves toward the third position together with the conveyance frame 30. As a result of this movement, the guide projection 30A also moves. Therefore, the cam arm 45 rotates in the clockwise direction and consequently moves the takeout electric wire grasping clamp 10C to the position indicated by the chain line in FIG. 7. And the takeout electric wire grasping clamp 10C can drop the electric wire W to a receiving tray, which is not illustrated, by opening its grasping blocks 14 and 14. The electric wire W is a finished product having terminal metal fittings attached to both ends thereof by the second terminal pressure connection unit 28.

[0038] Heretofore, the automatic cutting and pres-

sure connection apparatus 20 using the electric wire grasping clamp according to the present invention has been described. In the apparatus 20 as well, the angle formed by one of the contact faces 15B located in the rotation center side of the grasping block 14 in each of the electric wire grasping clamps (10A1 to 10A3, 10B1 to 10B4, and 10C) and the perpendicular line S is set so as to be larger than the angle formed between the other contact face and the perpendicular line. When handling an electric wire W of a different diameter dimension in the automatic cutting and pressure connection apparatus 20, therefore, it is possible to prevent the central axis of the electric wire W from being shifted due to the difference in diameter dimension. Furthermore, when grasping an electric wire W, it is possible to prevent a part of one contact face 15B from striking against the electric wire due to the rotation of the grasping blocks 14. In the description of the conveyance portion 27 of the automatic cutting and pressure connection apparatus 20, description has been made by paying attention to one electric wire W cut out. For each stroke of the conveyance frame 30, however, a newly cut out electric wire is conveyed successively. Smooth and efficient conveyance can be thus conducted.

[0039] While the embodiment has heretofore been described, the present invention is not limited to this, but various design changes can be made without departing from the spirit of the configuration.

Claims

1. An electric wire grasping clamp comprising:

a support block;
one pair of grasping blocks having sandwich faces for sandwiching an electric wire (W) between in a predetermined position, said pair of grasping blocks being supported by said support block so as to be freely rotatable between said position for sandwiching said electric wire and at least a horizontal position; and
grasping concave portions provided in said sandwich faces, each of said grasping concave portions having two contact faces coming into contact with outer periphery of said electric wire,
wherein an angle formed between one contact face located on a rotation center side in the grasping block when said grasping block is in a horizontal position state and a perpendicular line is set so as to be larger than an angle formed between the other contact face and the perpendicular line, and consequently said electric wire is located so as to have same axis height irrespective of a diameter of said electric wire.

2. An electric wire grasping clamp according to claim 1, wherein said one pair of grasping blocks are fixed to one pair of rotary arms, and said one pair of rotary arms are supported by said support block in rotation centers provided in different positions of said support block, so as to be freely rotatable.

3. An electric wire grasping clamp according to claim 1, wherein said support block moves in a horizontal direction while grasping said electric wire, conveys said electric wire, thereafter assumes a horizontal position, and returns to the original position.

4. An electric wire grasping clamp according to claims 1, wherein

each of said grasping blocks is formed of a plurality of grasping pieces disposed like a comb, and
grasping pieces of one of said grasping blocks can be inserted in grasping pieces of the other of said grasping blocks.

5. An electric wire grasping clamp comprising:

a grasping block having a first face and a second face, the first and second face to keep an electric wire threrebetween,
the first face having a first angle relative to a perpendicular line; and
the second face having a second angle relative to the perpendicular line,
wherein the first angle is different from the second angel.

FIG.1

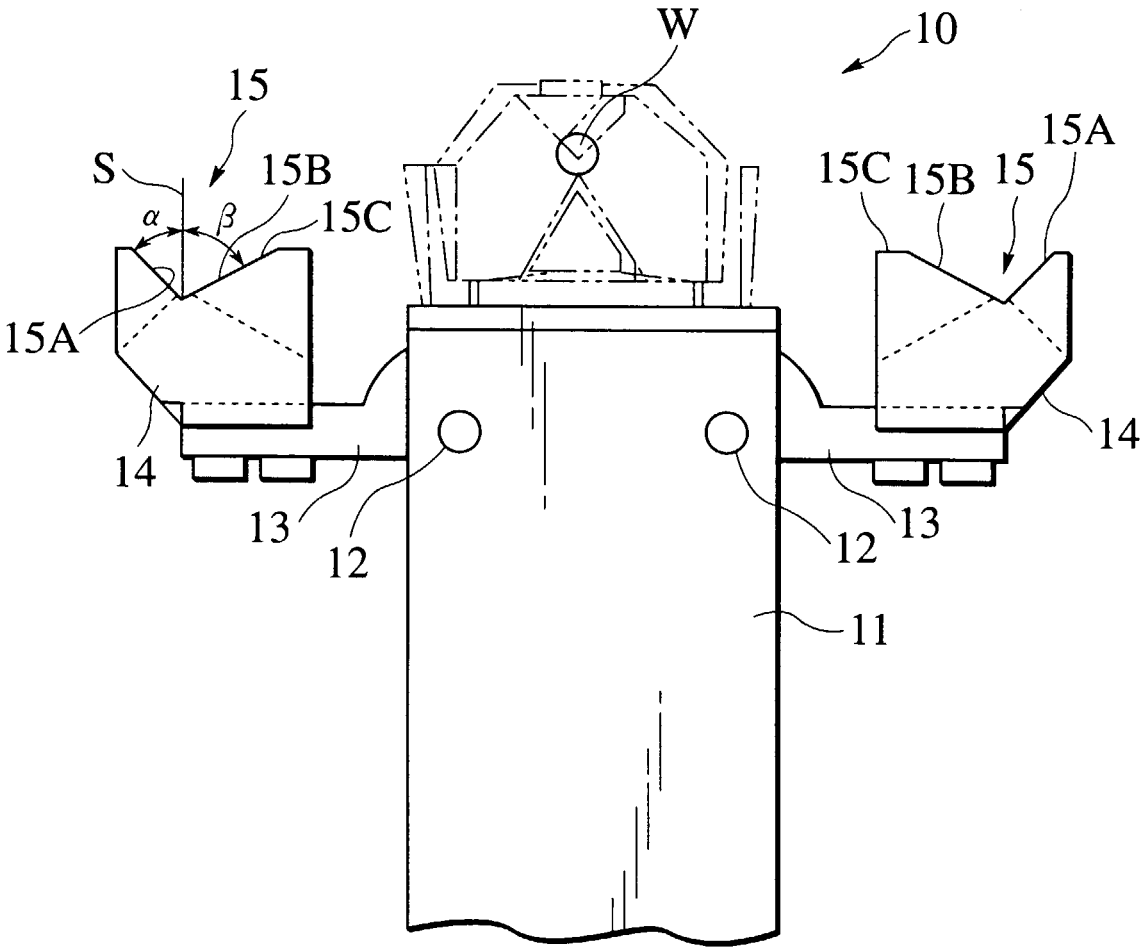


FIG.2A

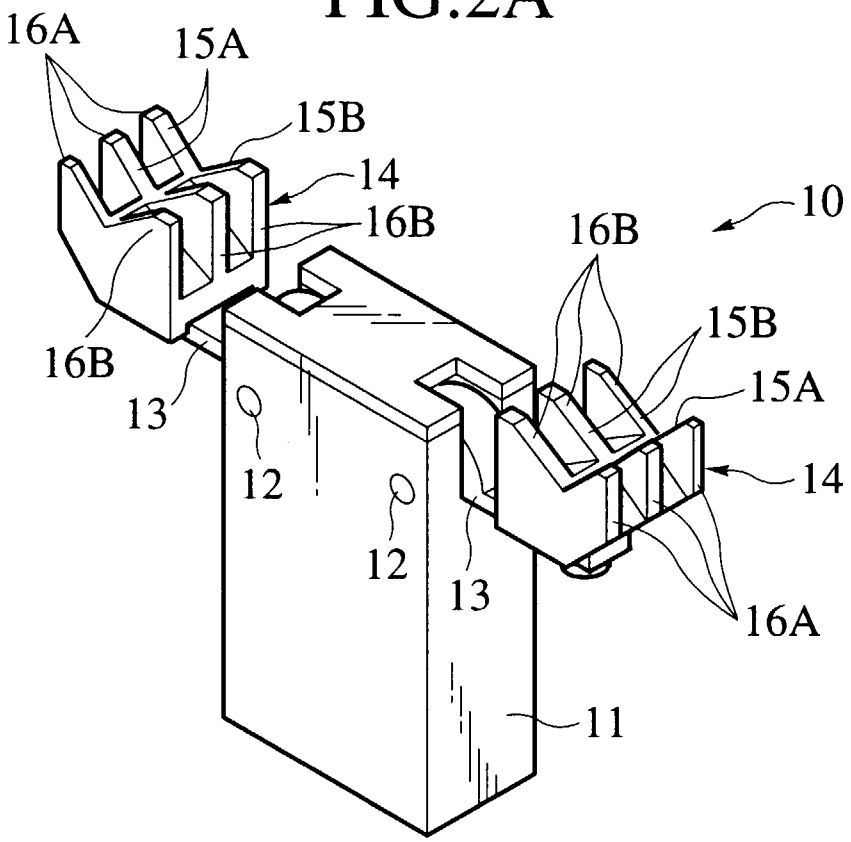
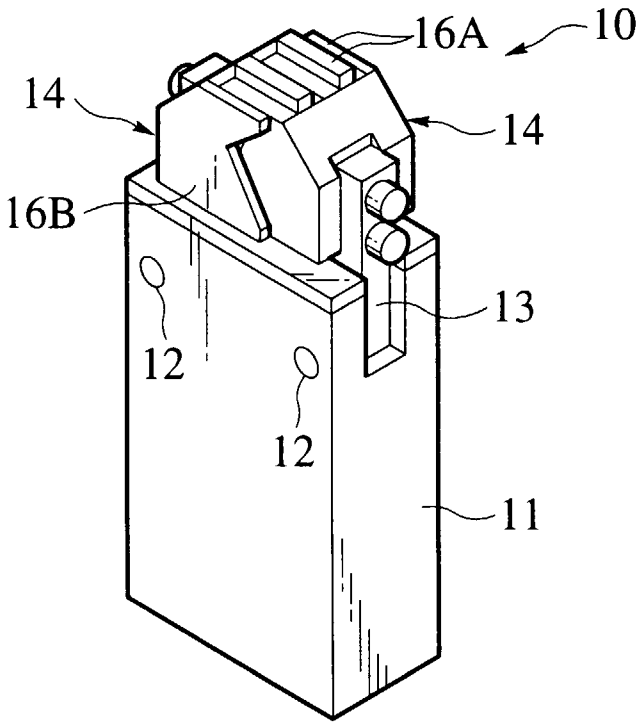

16A
15A
15B
14
16B
10
16B
15B
15A
14
16A
16B
13
12
12
13
11

FIG.2B


16A
10
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16B
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11

FIG.3

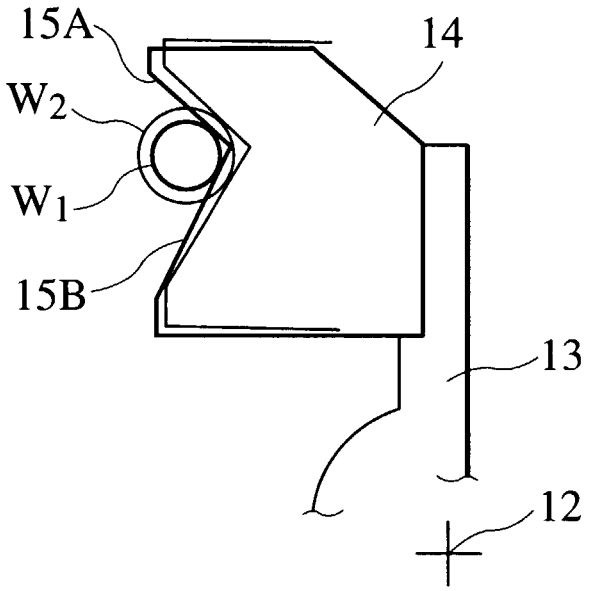


FIG.4

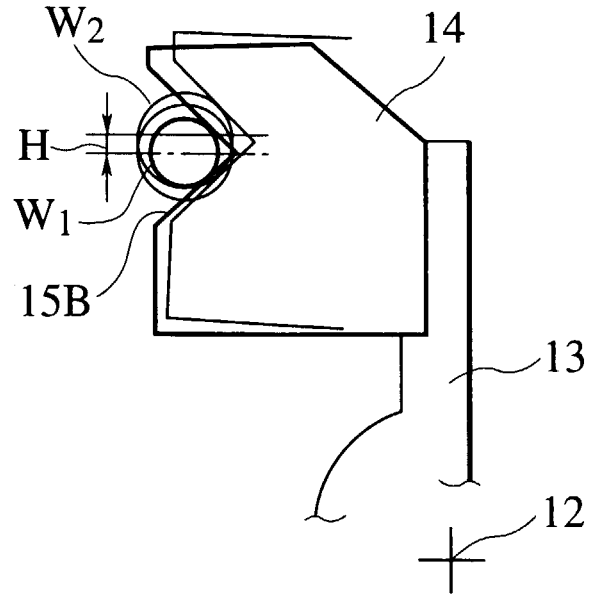
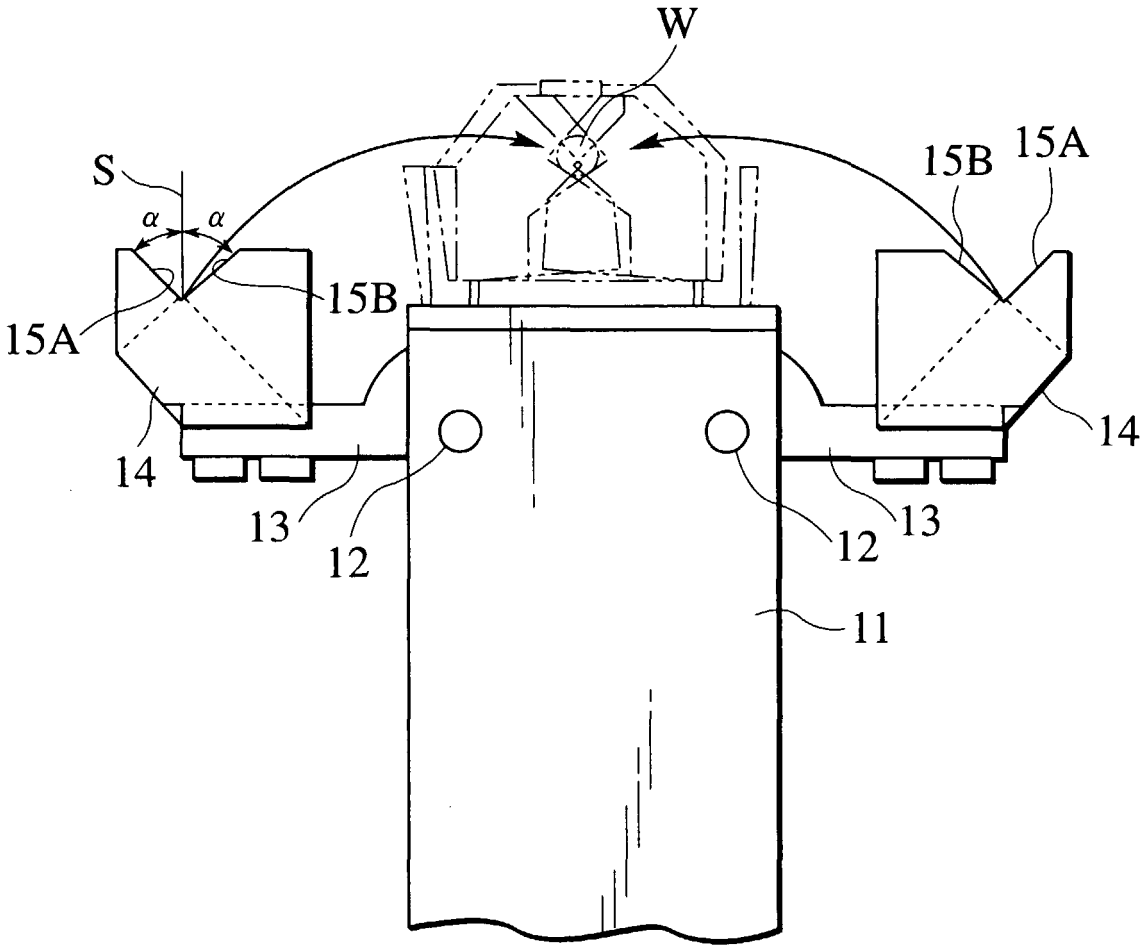
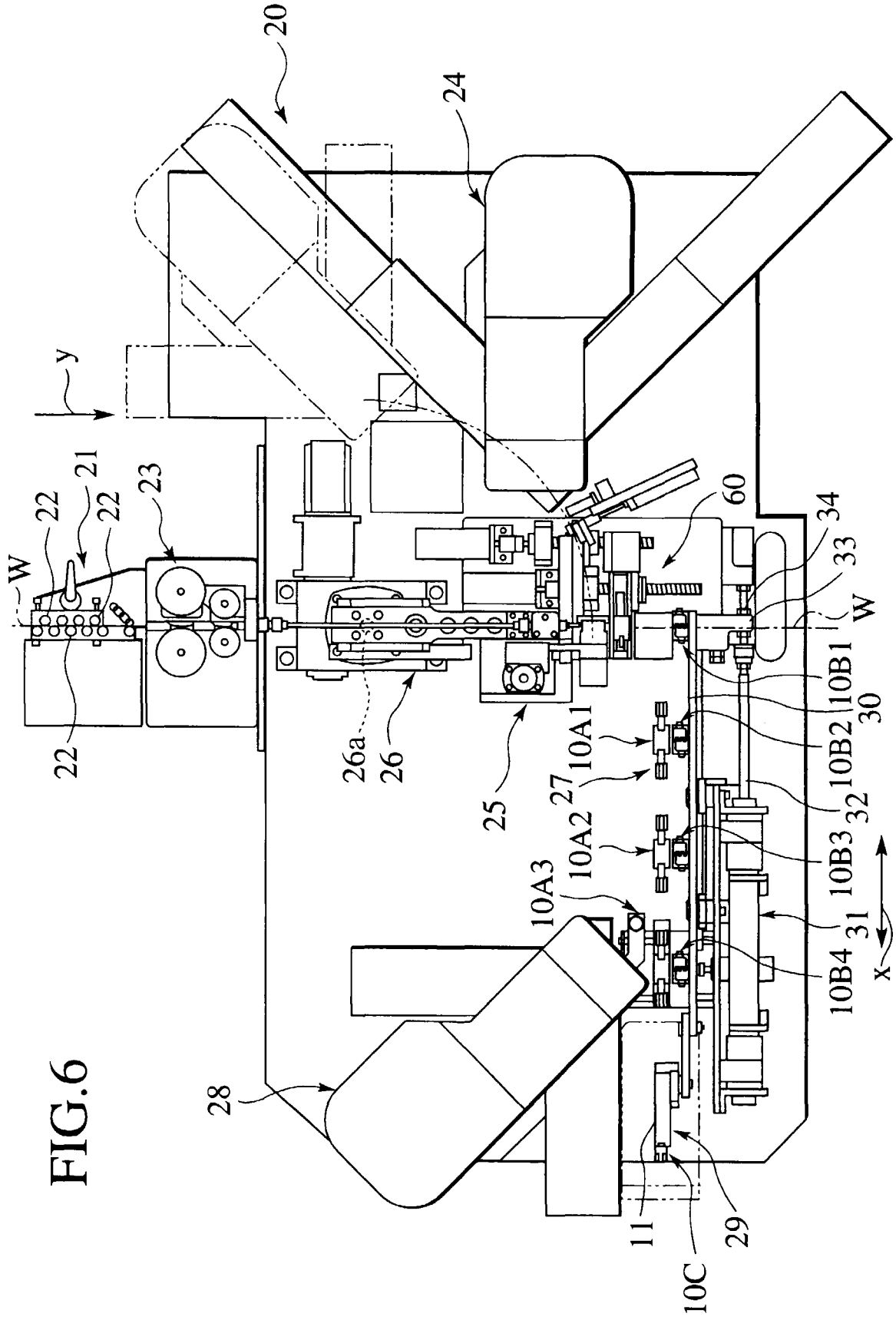


FIG.5

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23
W
22
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26a
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10A1
10B2
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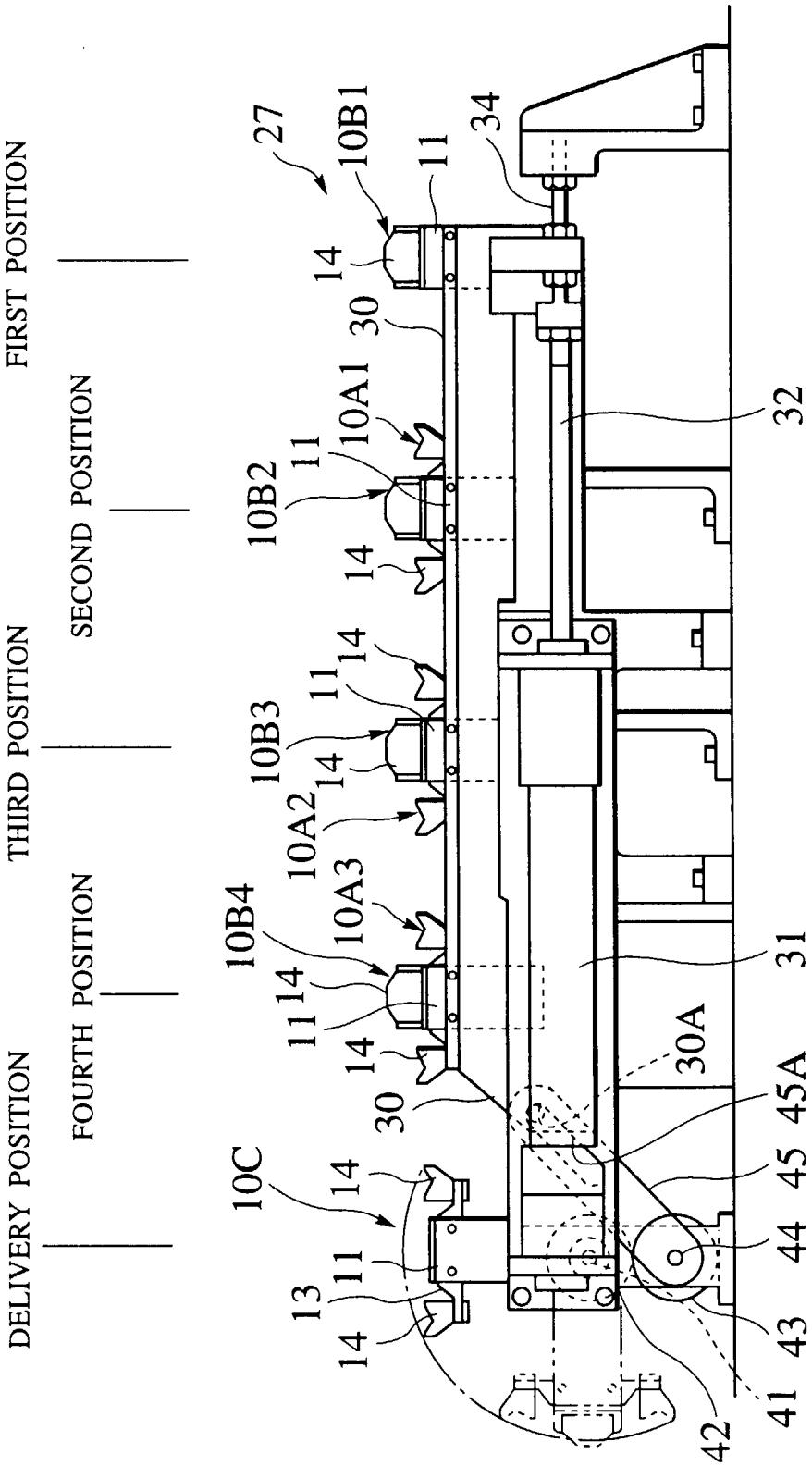
10A2
10B3
10A3
31
10B4
X
28
11
29
10C

FIG.6

FIG.7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SECOND POSITION
THIRD POSITION
FOURTH POSITION
DELIVERY POSITION
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10B1
11
34
14
30
10A1
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11
14
10B3
11
14
14
10A2
10A3
10B4
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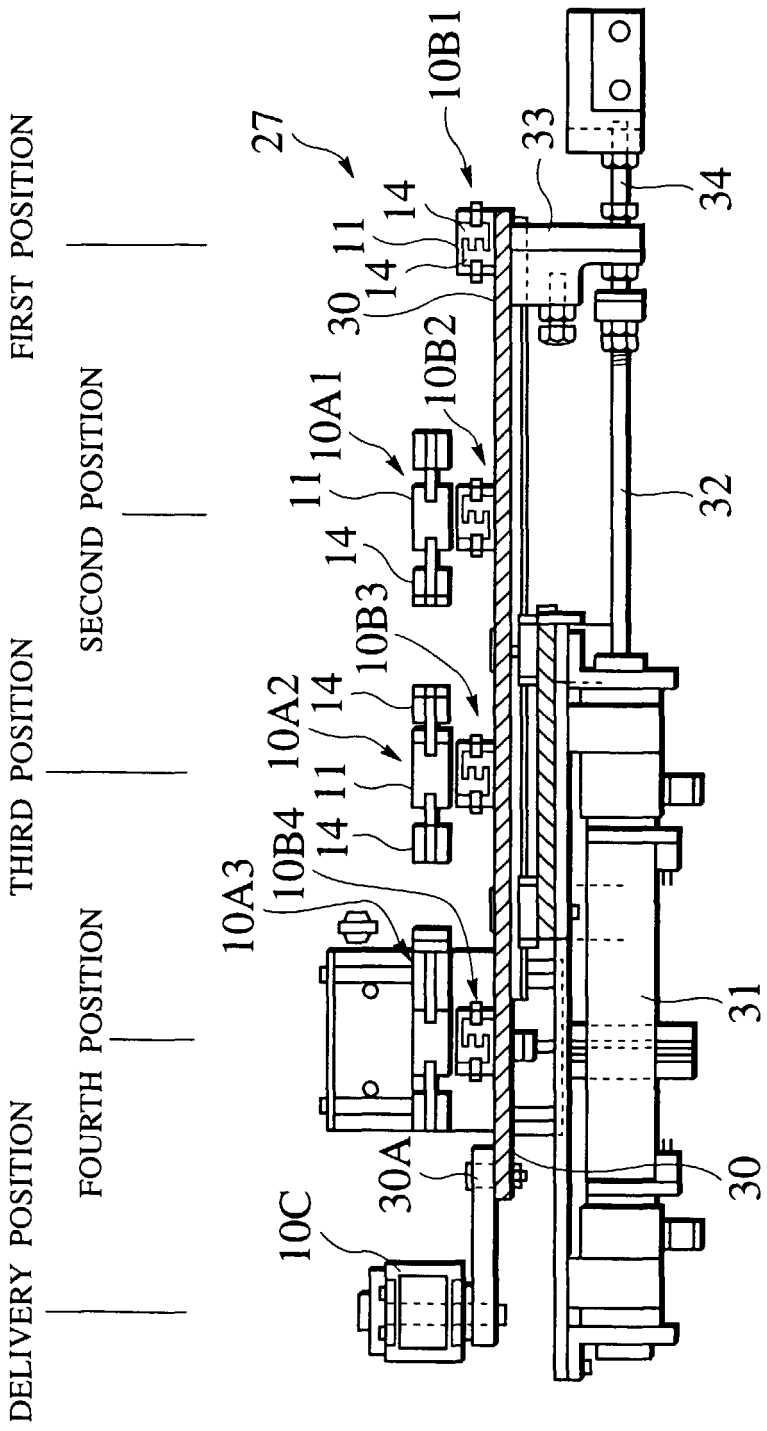
11
14
30
31
30A
45A
45
44
43
41
42
10C
14
11
13
14

FIG.8


FIRST POSITION
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THIRD POSITION
FOURTH POSITION
DELIVERY POSITION
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10A1
11
14
32
10B3
10A2
14
11
10B4
14
10A3
31
30A
30
10C