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(54) AUTOMATIC MACHINE TO BEND ELECTRO-WELDED MESHES

AUTOMATISCHE MASCHINE ZUM BIEGEN VON ELEKTROGESCHWEISSTEN GEFLECHTEN

MACHINE AUTOMATIQUE POUR LE CINTRAGE DE GRILLES ÉLECTRO SOUDÉES

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(56) References cited:
EP-A1- 1 977 841
FR-A1- 2 721 640
JP-A- S5 135 776
US-A- 3 867 829

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Description

FIELD OF APPLICATION

[0001] The present invention is relative to an automatic machine for bending electro-welded meshes, such as are used in the production of prefabricated reinforced concrete components.

PRIOR ART

[0002] The modern building industry resorts increasingly to the automated prefabrication of construction elements, so as to allow the production of components with very diverse dimensional characteristics and shapes, suitable for specific applications.

[0003] Prefabricated reinforced-concrete components are essentially formed with a mixture of concrete, poured in formworks with reinforcing steel meshes of corresponding shapes and dimensions embedded in the concrete.

[0004] The main complexity of the production system lies in the automatic shaping of the reinforcing components, formed from previously made flat electro-welded steel meshes. The bending machines currently used employ pins or pawls, arranged at right angles to the axis of the wire to be bent, and bending arms operated so as to bend the wires around the pins at a predetermined angle. The pins are arranged on a carrying guide, that forms the bending axis, and are adjusted manually. A single bending arm, having a size that is equal to the maximum width of the mesh, is operated by any known source of energy to describe an appropriate trajectory that performs the simultaneous bending of all the wires projecting on the same side of the mesh.

[0005] Naturally, it is also possible to bend the wires individually, but this solution is suitable only for the production of meshes of very limited dimensions because the working pace is extremely slowed down.

[0006] Thus, the automatic bending machines can currently be used only for regular shapings, and they are not suitable to meet the demand for components having complex shapes, such as chamfers, recesses and also internal openings.

[0007] For instance, Japanese patent JP S51 35776 A discloses a device for bending single wires combined with soldering transversal bars and longitudinal bars. The soldering electrode is also used as bending pin.

[0008] When the wires of the electro-welded meshes have uneven pitches, different lengths, gaps, etc., it is inevitable to resort to manual operations that are both laborious and hazardous, in addition to being time-consuming and costly.

[0009] In fact, continuous down times are required to adjust the distance of the pins to the varying pitch of the wires in the mesh.

SUMMARY OF THE INVENTION

[0010] A main objective of the invention is to provide an automatic machine for bending electro-welded meshes, that overcomes the drawbacks of the prior art by offering a solution that gives very accurate and reliable results, while eliminating the machine down times required for adjusting the operating shaping elements.

[0011] Further, the bending machine according to the invention achieves the objective of increasing productivity and offering great operating flexibility, as it is capable of bending single wires or multiple wires at the same time, without limitations in their position on the plane of the electro-welded mesh.

[0012] In particular, a further objective of the invention is to produce continuous-mode bent elements of variable height, made of metal wires or rods, in a completely automatic manner without the necessity of modifying the machine by replacing the operating shaping elements.

[0013] Another objective of the invention is to make it possible to produce continuous-mode bent elements having an asymmetric configuration, that is to say, with alternating inclined and vertical sections, as well as with sections having different inclinations and therefore different lengths.

[0014] These and other objectives are achieved with the machine whose characteristics are defined in the claims attached at the end of the present specification.

DESCRIPTION OF DRAWINGS

[0015] The objectives and characteristics of the invention will become evident from the following description, given by way of example and without limitations, with reference to the enclosed drawings, wherein:

- Figure 1 is a partial perspective view of an electro-welded mesh bent according to the prior art;
- figure 2 illustrates a top view and two side views of an example of electro-welded mesh bent with an automatic machine according to the invention;
- figure 3A illustrates schematically a top view of a bending unit in an automatic bending machine according to the invention;
- figure 3B illustrates schematically a top view of a machine provided with two opposed bending units, like the one of figure 3A;
- figure 3C illustrates schematically a top view of a machine provided with two opposed bending units, like the one of figure 3B, wherein the bending units are mounted on a deck movable in the same feed direction as the mesh;
- figures 4A and 4B illustrate the bending unit of figure 3A according, respectively, to the cross sections A-A and B-B;
- figures 5A and 5B illustrate, respectively, two details alternative to those of the solution described with reference to figures 4A and 4B;

- figure 6A illustrates a front view of the electro-welded mesh bending machine having at its right and left ends the two mechanisms for repositioning the bending pins or pawls;
- figure 6B illustrates a side view of the electro-welded mesh bending machine in the position of the mechanisms for repositioning the bending pins or pawls;
- figure 7 is a perspective view of the mechanisms for repositioning the bending pins or pawls;
- figure 8A illustrates the mechanism for repositioning the bending pins or pawls in the idle position;
- figure 8B shows the mechanism of figure 8A according to cross section YY;
- figure 9A illustrates the mechanism for repositioning the bending pins or pawls in the operating position;
- figure 9B illustrates the mechanism of figure 9A according to cross section YY.

DETAILED DESCRIPTION OF THE INVENTION

[0016] Figure 1 illustrates in a partial perspective view an electro-welded mesh, bent by means of a prior-art machine. As can be seen, the steel wires or rods 1 have substantially equal lengths, they are arranged at a constant pitch, and the sides of the mesh are even and straight.

[0017] Figure 2 illustrates schematically a top view and two side views of an example of electro-welded mesh bent using an automatic machine according to the invention. As can be seen, this mesh has steel wires or rods 1 of different lengths and with different pitches. Moreover, the sides of the mesh are uneven, as they have projections and recesses with different inclinations, but the mesh also shows an internal opening A.

[0018] Figure 3A shows schematically a top view of a bending unit U in an automatic bending machine according to the invention, arranged below the running deck of the mesh to be welded.

[0019] Figure 3A displays a central bending pin or pawl 2, two bending pins 2-1 arranged on the left side and two bending pins 2-2 arranged on the right side. These bending pins are controlled selectively and independently of each other by a centralized machine control unit (non shown), according to a program depending on the shape of the bent mesh that is to be obtained. Naturally, the number of side pins is not binding and depends on the maximum number of wires that need to be bent.

[0020] Similarly, in figure 3A is shown a central bending arm 3, a right bending arm 4 and a left bending arm 4-1; said bending arms are connected to the bending unit and are controlled selectively and independently of each other so as to move in a composite motion, in a coordinated manner with the corresponding bending pins, as will be seen below.

[0021] In figure 3A are also shown a central mobile pin support 5, a right lateral mobile pin support 6 and a left lateral mobile pin support 6-1. These mobile pin supports are also controlled independently of one another.

[0022] In order to allow the machine to achieve its main objective, i.e., that of reaching all the bending points or axes of the mesh, it is required that the electro-welded mesh formed with the crossed wires or rods 1 be held still, while the bending unit must be able to move in a straight line in the two directions of a horizontal plane along two axes perpendicular to each other X and Y, and must also be able to complete a full rotation in both directions around an axis of rotation W, as shown by the respective arrows in figure 3A. These movements are driven by a motor of any known type (not shown in the patent drawings).

[0023] Figure 3B illustrates schematically a top view of a machine provided with two bending units U1 and U2, like the one of figure 3A, opposed to each other on the two sides of the mesh R. In this solution, the mesh is movable in a rectilinear direction as is shown by the arrow in the figure along a running deck, driven by any known means (not shown in the figure) suitable for this purpose.

[0024] Figure 3C is a schematic top view of the machine equipped with the two bending units U1 and U2 as in the embodiment shown in figure 3B, in which the bending units are installed on a deck P arranged transversally to the longitudinal axis of the mesh R. The deck P is driven to move on two rails G, that are supported on the main body 10 of the machine and that run laterally to the mesh R and parallel to the longitudinal axis of the latter.

[0025] In this type of configuration the electro-welded mesh is supported and held in position by suitable supports of the main body 10.

[0026] Figures 4A and 4B show, respectively, the bending unit of figure 3A according to cross sections A-A and B-B. In these figures are shown the guides 7 of the mobile supports 5, 6 and 6-1, as well as the actuators 8 that drive the vertical lifting of the same supports along the axis Z. The control of each actuator 8 is independent and makes it possible to bring to the bending position, through the mobile supports, only and exclusively those pins that for their position, and/or pitch, and/or quantity are configured with the wires to be bent. The operation of each actuator 8 is achieved, for example, through a hydraulic cylinder equipped with respective solenoid valves (not shown), controlled by the control unit of the machine. It is essential that the lifting of the actuators 8 be adjusted to the extent of making the bending pins 2, 2-1, 2-2 emerge above the working surface. These characteristics of the invention, combined with the movements of the bending arms 3, 4 and 4-1, which will be considered later, make it possible to achieve the bending of the wires 1 in the mesh in a single, partial or complete mode.

[0027] In figures 4A and 4B, the reference numeral 9 indicates the plane over which the electro-welded mesh runs, while the reference U indicates the structure that contains all the previously described mechanical components that play a role in the bending of the mesh. The whole machine can be mobile or fixed, depending on the type of mesh feeding system or on the form of the shaped

reinforcing steel mesh that is to be produced. If the whole machine is mobile, it can move in the direction of the X, Y and W axes, as mentioned above.

[0028] In figures 3A, 4A and 4B is also shown an actuator 11, powered by any known energy source (not shown), such as an electric motor, a hydraulic motor or a similar device. The actuator 11 determines the composite motion of each bending arm 3, 4 and 4-1, to rotate a corresponding crank 12 through a shaft 13. Each crank 12 is integrally linked to the shaft 13 through a respective connecting pin 14 operated by a selector 15. The connecting pins 14 and their selectors 15 can be omitted, as can be seen later, if any type of split drive is used to drive each crank 12.

[0029] Each selector 15 controls the composite movement of the bending arms 3, 4 and 4-1 through an articulated kinematic mechanism that includes a connecting rod 16, pivoted at one end to the crank 12 by means of a pin 18. The connecting rod 16 is pivotally connected at its other end to a counteracting arm 17 through a pin 19. The counteracting arm 17 is also hinged to the main body of the bending unit U through a pin 21. Thus the counteracting arm 17, bearing on the connecting rod 16 through the pin 19, counteracts the force that is generated between the bending pin or pawl 2, 2-1, 2-2 and the corresponding arm 3, 4, 4-1 and forces the same arm to perform the composite movement so as to follow the suitable bending path.

[0030] In the situation in which the bending pin or pawl 2, 2-1, or 2-2 is in a correct bending position and the arm 3, 4, or 4-1 is in a connecting position below the respective pin or pawl, the path described by the bending arm forces the wire 1 to bend around the cylindrical surface of the pawl itself. The bending angle may vary from 0°to 180°.

[0031] In figure 4B is also shown, in cross section, a fixed striker plate 20 that supports the running deck 9 of the electro-welded mesh to be bent. The striker plate 20 counters the thrust that is applied on the wire 1 when it is being bent, through the movement of the bending arm.

[0032] In the embodiment described so far, the bending machine includes a single actuator 11 that selectively controls the motion of the various bending arms 3, 4-1, 4-2 according to a specified program determined by a control unit. Advantageously, however, the bending arms are controlled individually and independently, as shown alternatively in the solutions of figures 5A and 5B.

[0033] In these solutions, the connecting pin 14 and the selecting devices 15 that connect the crank 12 to the shaft 13 are eliminated. Each of the kinematic mechanisms comprising the bending arms 3, 4, 4-1, the respective cranks 12 and the shaft 13 is driven by a respective actuator 111. The set of actuators 111 replaces, and shares the work, of the single actuator 11 present in the solution previously described with reference to figures 3A and 4A-4B.

[0034] A further characterizing element of the invention is the device for automatically positioning on a support 32 (fig. 6B), according to the program of the control unit, the kinematic bending mechanisms so as to rapidly, economically and safely respond to the need of reconfiguring the bending units as required with the different pitches between the wires 1 that form the sections of electro-welded mesh.

[0035] The technical solution described hereinbelow enables the reconfiguration of the machine in the time interval from when the bent mesh panel is discharged to when a new one is loaded without requiring the intervention of the operator.

[0036] In fact, as can be seen in the front view of figure 6A, past the margins of a running deck S are arranged two service areas available to the bending units U1 and U2 to carry out the procedures necessary for repositioning the bending pawls. In said areas, as shown in figure 6B, are fastened to a support 32 the mechanisms for repositioning the bending pawls described below also with reference to figures 7, 8A, 8B, 9A and 9B.

[0037] Said mechanisms for positioning the bending pawls are fastened to the support 32 by means of a locking bracket 33 joined to the lever holding bar 28 by means of a suitable number of bolts. At one end of the lever support 28 is fastened, by means of a pin 26, an end of the pawl locking lever 25 characterized in having a "C" shaped cross section. At the other end of the lever holding bar 28 is fastened an end of an actuator, the piston of which is connected by means of a pin to the pawl locking lever 25. The free end of the pawl locking lever 25 ends at the pawl release toe 24.

[0038] The detail shown in portion AX of figure 8B illustrates the structure formed in the base of the pawls 2-1 and 2-2 in which is present a recess necessary to house the pawl locking pin 22. In the detail shown in portion B of figure 8A, the pawl locking pins 22 are held in the idle position by the combined action of the thrust from the spring 23 and the opposing action of the stops for the pin 29; in this position the pawl locking pins 22 engage the positioning grooves 30 formed in the mobile supports 6 and 6.1. To obtain the displacement of one of the bending pawls 2-1 or 2-2, the bending unit shifts laterally as far as the margins of the working area so that the pawl that is to be displaced reaches the position of the pawl release mechanism. In this situation, the actuator 27 actuates the arm 25 so that, by rotating in the direction of the arrow shown in figure 8B, the pawl release toe 24 applies a pressure on the head of the pawl locking pin 22 sufficient to force it backward and move it clear of the positioning groove 30.

[0039] In this configuration shown in figures 9A and 9B, the top part of the bending pin 2-1 and 2-2 is located between the two arms of the "C" described by the cross section of the pawl locking lever 25 and, in the detail BX of figure 9B, it can be seen that the pawl locking pin 22 in the drawn back position is no longer engaged in the positioning groove 30.

[0040] Subsequently, the bending unit starts to move in a direction such as to bring the bending pawl to the new position. When the displacement necessary to offset

the axis of the pawl locking pin 22 and of the groove 30 is completed, the actuator 27 is manoeuvred by the control unit so that it rotates the pawl locking lever 25 by the angle necessary to relieve the pressure on the pawl locking pin 22 but, at the same time, sufficient to maintain the top part of the bending pin 2-1 or 2-2 between the two arms of the "C" described by the cross section of the pawl locking level 25. In this manner, the bending pin 2-1 or 2-2, remaining still, reaches the new position thanks to the movement of the bending unit. When the new position is reached, the axis of the bending pin 2-1 or 2-2 coincides with the axis in the selected positioning groove 30 and the opposing spring 23 pushes the pawl locking pin 22 to the locking position. The control unit thus controls the actuator 27 so that the pawl locking lever 25 reaches the idle position (figures 8A and 8B). This procedure is repeated for each of the pawls 2-1 and 2-2 that are to be positioned.

[0041] When the last necessary repositioning position is completed, the bending unit resumes the waiting position for the next section of mesh to be bent.

[0042] Naturally, the previously described solution represents only one preferred embodiment of the bending pawl positioning device; it remains understood that any alternative technical solution can be adopted to achieve the same result.

[0043] From the foregoing description it is understood that the essential result of the innovation according to the invention lies in the possibility of using, for shaping electro-welded meshes, a plurality of mobile bending-pin supports and a corresponding plurality of bending arms that together form individual bending units independent of each other.

[0044] Consequently, the machine according to the invention makes it possible to drastically reduce the bending times of the electro-welded meshes, as it is possible to operate the bending units in the most selective manner, that is, individually or in groups.

Claims

1. An automatic machine to bend electro-welded meshes, which are formed by longitudinal and transversal wires (1), having different lengths and/or different pitches, the machine bearing at least one bending unit (U) provided with a plurality of bending pins (2, 2-1, 2-2), operated on vertical direction, said bending pins being adapted to be spaced out by a distance equal to the pitch of the mesh (R) to be bent and a plurality of bending arms (3, 4, 4-1), being operated with a 2-axes motion in order to bend the wires around the bending pins, said bending unit (U) being mounted on the machine's main body (10) and being capable to move in a direction transversal to the direction in which the mesh (R) moves, said bending unit (U) being also able to rotate around its vertical axis (W), **characterized by the fact that** the bending pins (2, 2-1, 2-2) are operated by their respective actuators (8) housed in the bending unit (U), which are adapted to be selectively and independently driven according to a specified program through a control unit, and the bending arms (3, 4, 4.-1) are linked to the bending unit (U) via an articulated kinematic mechanism (11-13, 16-19) and are adapted to be selectively and independently driven according to said specified program through said control unit to cope with the respective bending pins.

2. An automatic machine to bend electro-welded metal meshes, according to claim 1, **characterized by the fact that** the actuators (8) are suited to operate the bending pins in a vertical direction (2, 2-1, 2-2) through respective bearings (5,6, 6-1) held in their position by guides (7), said vertical displacement being adjusted to let the binding pins (2, 2-1, 2-2) rise above the working surface.

3. An automatic machine to bend electro-welded metal meshes, according to claim 1, **characterized by the fact that** said articulated kinematic mechanism is provided with an actuator (11), whose shaft (13) operates, via a crank (12), a connection rod (16), pivotally connected to a counteracting arm (17) hinged on the bending unit (U).

4. An automatic machine to bend electro-welded metal meshes, according to claim 3, **characterized by the fact that** each crank (12) is integrally linked to said shaft (13) by a connection pin (14) operated by a selector (15).

5. An automatic machine to bend electro-welded metal meshes, according to claim 3, **characterized by the fact that** a pin (18) is suited to allow the rotation between the crank (12) and the connecting rod (16), while a pivot (19) is suited to allow the rotation between the connection rod (16) and the counteracting arm (17).

6. An automatic machine to bend electro-welded metal meshes, according to claim 2, **characterized by the fact that** the bearings (6, 6-1) holding the bending pins (2-1, 2-2) are provided on their top surface with positioning grooves (30), in which a plurality of selectively engaged holding pins (22) are prompted by springs and hooked by their relative bending pins (2-1, 2-2), said holding pins (22) being operated by relative motorized arms (24-27), which are hinged to a holding bar (28) attached to the main body (10) of the machine.

7. An automatic machine to bend electro-welded metal meshes, according to claim 1, **characterized by the fact that** two bending units (U1, U2) are provided,

mounted on deck (P) which is laid across the longitudinal axis of the mesh (R) and movable on two rails (G) held by the body (10) of the machine, the rails (G) run on both sides of the mesh (R) and in the same direction as the longitudinal axis of the mesh (R).

Patentansprüche

1. Automatische Maschine zum Biegen elektrisch verschweißter Gitter, die aus Längs- und Quer-Drähten (1) bestehen, unterschiedliche Längen und/oder unterschiedliche Abstände haben, wobei die Maschine wenigstens eine Biege-Einheit (U) aufweist, die mit einer Vielzahl von Biege-Bolzen (2, 2-1, 2-2) versehen ist, die in vertikaler Richtung betätigt werden, und die Biege-Bolzen so eingerichtet sind, dass sie in einem Abstand verteilt sind, der der Teilung des zu biegenden Gitters (R) entspricht, und eine Vielzahl von Biege-Armen (3, 4, 4-1) mit einer Zwei-Achsen-Bewegung betätigt werden, um die Drähte um die Biege-Bolzen herum zu biegen, wobei die Biege-Einheit (U) an dem Hauptkörper (10) der Maschine angebracht ist und in der Lage ist, sich in einer Richtung quer zu der Richtung zu bewegen, in der sich das Gitter (R) bewegt, und die Biege-Einheit (U) auch in der Lage ist, sich um ihre vertikale Achse (W) herum zu drehen,
dadurch gekennzeichnet, dass die Biege-Bolzen (2, 2-1, 2-2) mittels ihrer jeweiligen Betätigungselemente (8) betätigt werden, die in der Biege-Einheit (U) aufgenommen sind und die so eingerichtet sind, dass sie entsprechend einem vorgegebenen Programm über eine Steuereinheit selektiv und unabhängig angesteuert werden, und die Biege-Arme (3, 4, 4-1) mit der Biege-Einheit (U) über einen gelenkigen kinematischen Mechanismus (11-13, 16-19) verbunden sind und so eingerichtet sind, dass sie entsprechend dem vorgegebenen Programm über die Steuereinheit selektiv und unabhängig so angetrieben werden, dass sie die jeweiligen Biege-Bolzen abdecken.

2. Automatische Maschine zum Biegen elektrisch verschweißter Metallgitter nach Anspruch 1, **dadurch gekennzeichnet, dass** die Betätigungselemente (8) dazu geeignet sind, die Biege-Bolzen in einer vertikalen Richtung (2-1, 2-2) über entsprechende Lager (5, 6, 6-1) zu betätigen, die durch Führungen (7) in Position gehalten werden, wobei die vertikale Verschiebung so reguliert wird, dass sich die Biege-Bolzen (2, 2-1, 2-2) über die Bearbeitungsfläche anheben.

3. Automatische Maschine zum Biegen elektrisch verschweißter Metallgitter nach Anspruch 1, **dadurch gekennzeichnet, dass** der gelenkige kinematische Mechanismus mit einem Betätigungselement (11) versehen ist, dessen Welle (13) über eine Kurbel (12) eine Verbindungsstange (16) betätigt, die schwenkbar mit einem entgegenwirkenden Arm (17) verbunden ist, der an der Biege-Einheit (U) angelenkt ist.

4. Automatische Maschine zum Biegen elektrisch verschweißter Metallgitter nach Anspruch 3, **dadurch gekennzeichnet, dass** jede Kurbel (12) über einen Verbindungsbolzen (14), der mittels einer Wähleinrichtung (15) betätigt wird, integral mit der Welle (13) verbunden ist.

5. Automatische Maschine zum Biegen elektrisch verschweißter Metallgitter nach Anspruch 3, **dadurch gekennzeichnet, dass** ein Bolzen (18) dazu geeignet ist, die Drehung der Kurbelwelle und der Verbindungsstange (16) zueinander zuzulassen, während ein Drehzapfen (19) dazu geeignet ist, die Drehung der Verbindungsstange (16) und des entgegenwirkenden Arms (17) zu zuzulassen.

6. Automatische Maschine zum Biegen elektrisch verschweißter Metallgitter nach Anspruch 2, **dadurch gekennzeichnet, dass** die Lager (6, 6-1), die die Biege-Bolzen (2-1, 2-2) aufnehmen, an ihrer Oberseite mit Positioniernuten (30) versehen sind, in denen eine Vielzahl selektiv in Eingriff kommender Halte-Bolzen (22) von Federn geführt werden und an ihren jeweiligen Biege-Bolzen (2-1, 2-2) eingehakt werden, wobei die Halte-Bolzen (22) durch jeweilige motorgetriebene Arme (24-27) betätigt werden, die an einer Halteschiene (28) angelenkt sind, die an dem Hauptkörper (10) der Maschine angebracht sind.

7. Automatische Maschine zum Biegen elektrisch verschweißter Metallgitter nach Anspruch 1, **gekennzeichnet durch** die Tatsache, dass zwei Biege-Einheiten (U1, U2) vorhanden sind, die an einem Träger (P) angebracht sind, der über der Längsachse des Gitters (R) liegt und auf zwei Schienen (G) bewegt werden kann, die von dem Körper (10) der Maschine gehalten werden, wobei die Schienen (G) auf beiden Seiten des Gitters (R) und in der gleichen Richtung wie die Längsachse des Gitters (R) verlaufen.

Revendications

1. Machine automatique pour plier des mailles électrosoudées, qui sont formées par des fils (1) longitudinaux et transversaux, ayant des longueurs différentes et / ou des pas différents, la machine comportant au moins une unité de pliage (U) munie d'une pluralité de broches de pliage (2, 2-1, 2-2), fonctionnant dans la direction verticale, lesdites broches de pliage

étant agencées pour espacer d'une distance égale au pas du filet (R) à plier, et une pluralité de bras de pliage (3, 4, 4-1) étant actionnés par un mouvement sur 2 axes afin de plier les fils autour des broches de pliage, ladite unité de pliage (U) étant montée sur le corps principal (10) de la machine et étant capable de se déplacer dans une direction transversale à la direction dans laquelle le filet (R) se déplace, ladite unité de pliage (U) étant également capable de tourner autour de son axe vertical (W), **caractérisée par le fait que** les broches de pliage (2, 2-1, 2-2) sont actionnées par leurs actionneurs (8) respectifs logés dans l'unité de pliage (U), qui sont adaptés sélectivement et indépendamment pour entraîner selon un programme spécifié par l'intermédiaire d'une unité de commande, et les bras de pliage (3, 4, 4-1) sont reliés à l'unité de pliage (U) par l'intermédiaire d'un mécanisme cinématique articulé (11-13, 16-19) et sont adaptés sélectivement et indépendamment pour entraîner en fonction dudit programme spécifié à travers ladite unité de commande pour faire face aux broches de pliage respectives.

2. Machine automatique pour plier des mailles métalliques électro-soudés selon la revendication 1, **caractérisée par le fait que** les actionneurs (8) sont adaptés pour faire fonctionner les broches de pliage (2, 2-1, 2-2) dans une direction verticale par des paliers respectifs (5, 6, 6-1) maintenus dans leur position par des guides (7), ledit déplacement vertical étant ajusté pour laisser les broches de pliage (2, 2-1, 2-2) s'élever au-dessus de la surface de travail.

3. Machine automatique pour plier des mailles métalliques électro-soudés selon la revendication 1, **caractérisée par le fait que** ledit mécanisme cinématique articulé est muni d'un actionneur (11), dont l'arbre (13) agit par l'intermédiaire d'une manivelle (12), d'une tige de connexion (16), reliées de façon pivotante à un bras de contre (17) articulé sur l'unité de pliage (U).

4. Machine automatique pour plier des mailles métalliques électro-soudés selon la revendication 3, **caractérisée par le fait que** chaque manivelle (12) est intégralement reliée audit arbre (13) par une broche de connexion (14) actionnée par un sélecteur (15).

5. Machine automatique pour plier des mailles métalliques électro-soudés selon la revendication 3, **caractérisée par le fait qu**'une broche (18) est adaptée pour permettre la rotation entre la manivelle (12) et la tige de connexion (16), tandis qu'un pivotement (19) est adapté pour permettre la rotation entre la tige de connexion (16) et le bras de contre (17).

6. Machine automatique pour plier des mailles métalliques électro-soudés selon la revendication 2, **caractérisée par le fait que** les paliers (6, 6-1) qui maintiennent les broches de pliage (2-1, 2-2) sont prévus sur leur surface supérieure avec des rainures de positionnement (30), dans lequel une pluralité de broches de maintien (22) engagées sélectivement sont poussées par des ressorts et accrochées par leurs broches de pliage (2-1, 2-2) correspondantes, lesdites broches de maintien (22) étant actionnées par rapport aux bras motorisés (24-27), qui sont articulés sur une barre de maintien (28) fixée au corps principal (10) de la machine.

7. Machine automatique pour plier des mailles métalliques électro-soudés selon la revendication 1, **caractérisée par le fait que** deux unités de pliage (U1, U2) sont prévues, montées sur le pont (P) qui est fixé transversalement à l'axe longitudinal du filet (R) et pouvant se déplacer sur deux rails (G) maintenus par le corps (10) de la machine, les rails (G) étant dirigés sur les deux côtés du filet (R) et dans la même direction que l'axe longitudinal du filet (R).

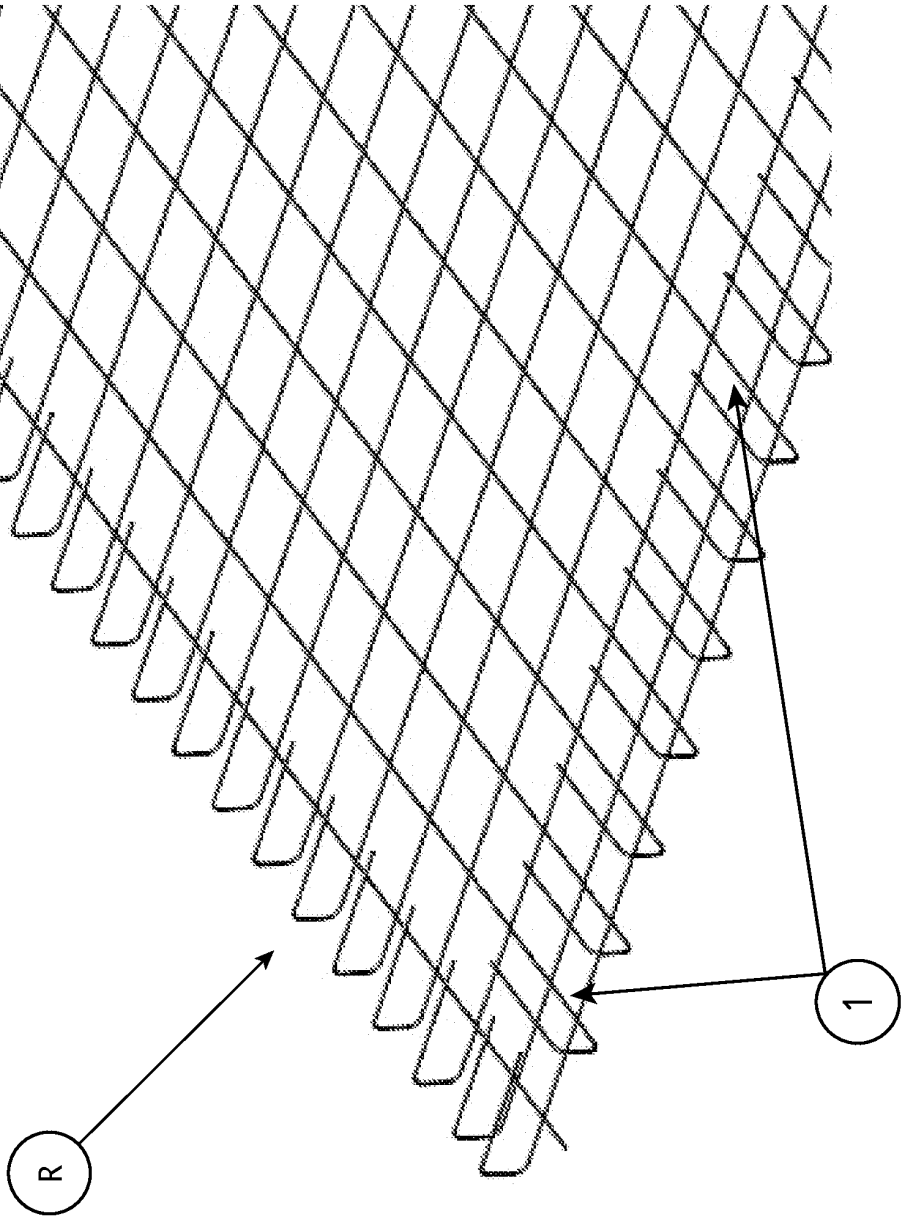

FIG. 1

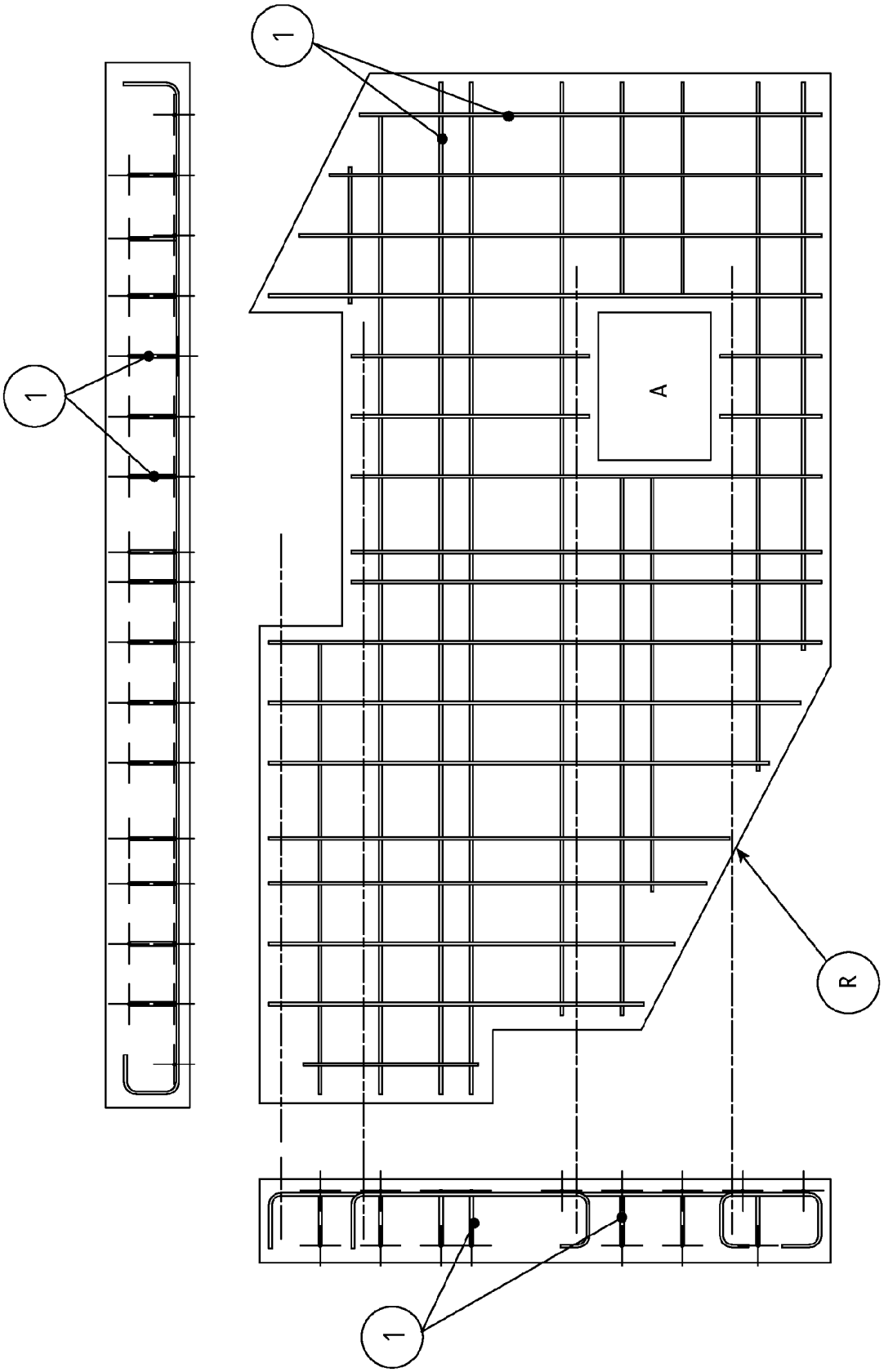

FIG. 2

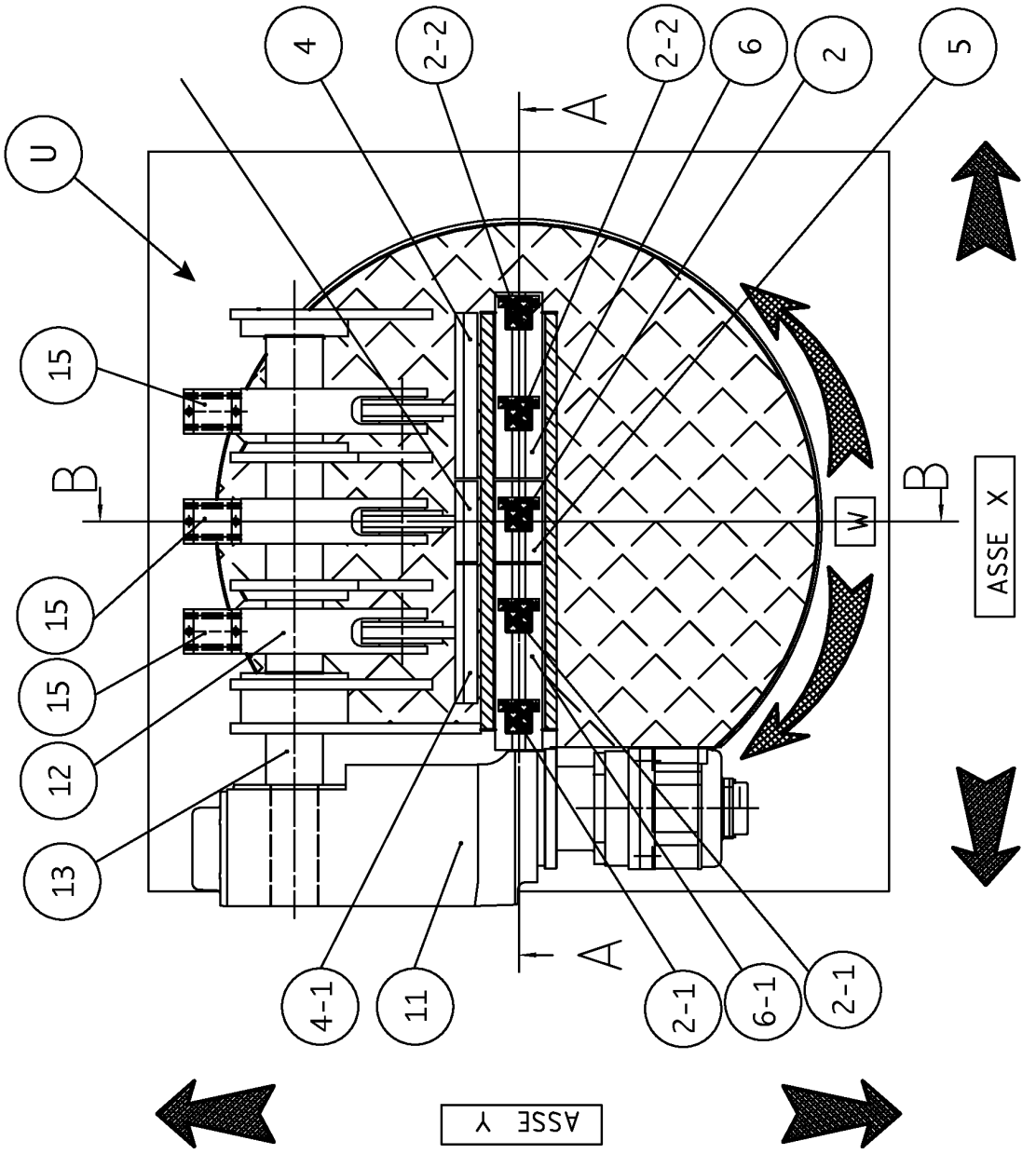

FIG. 3A

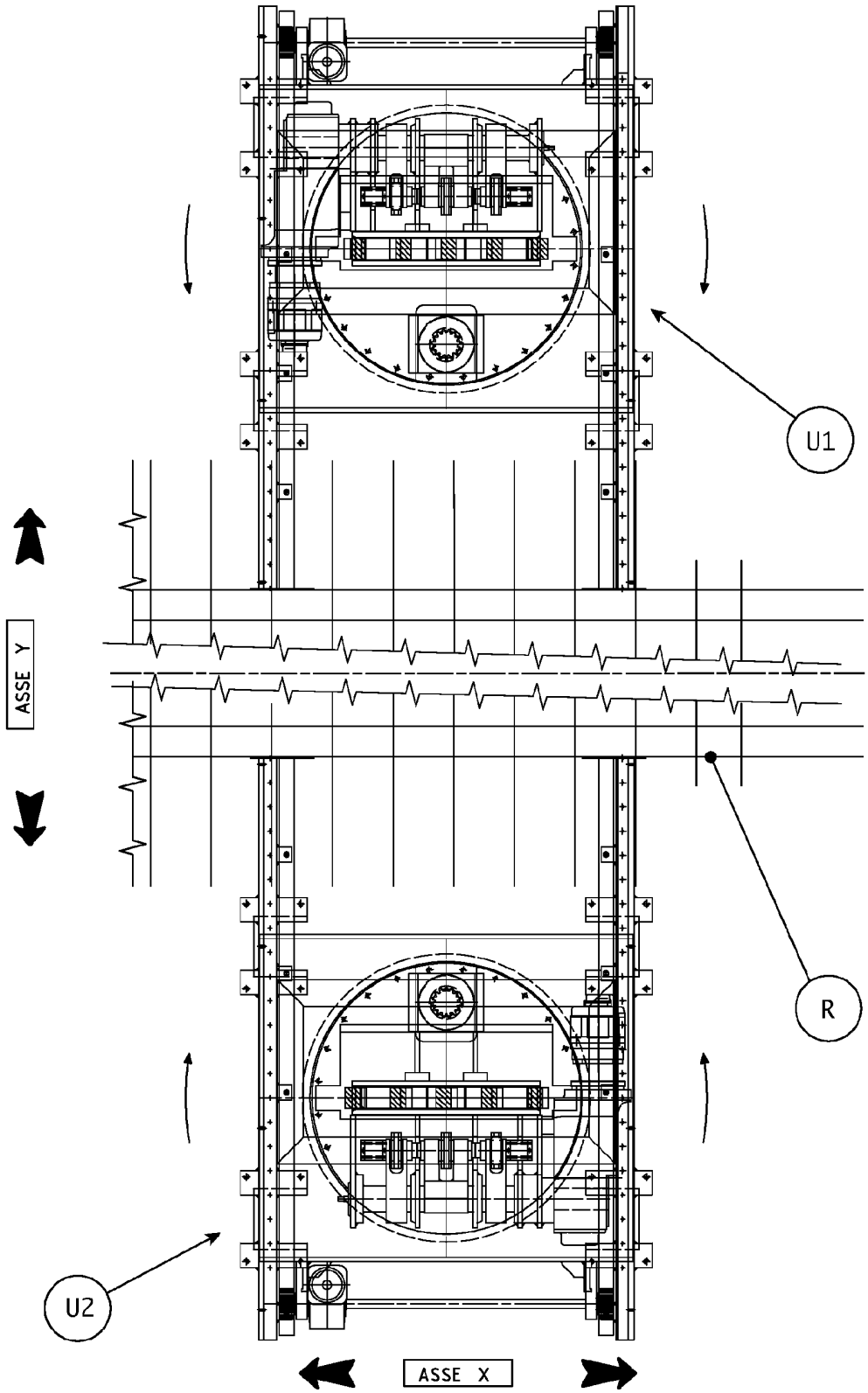

FIG. 3B

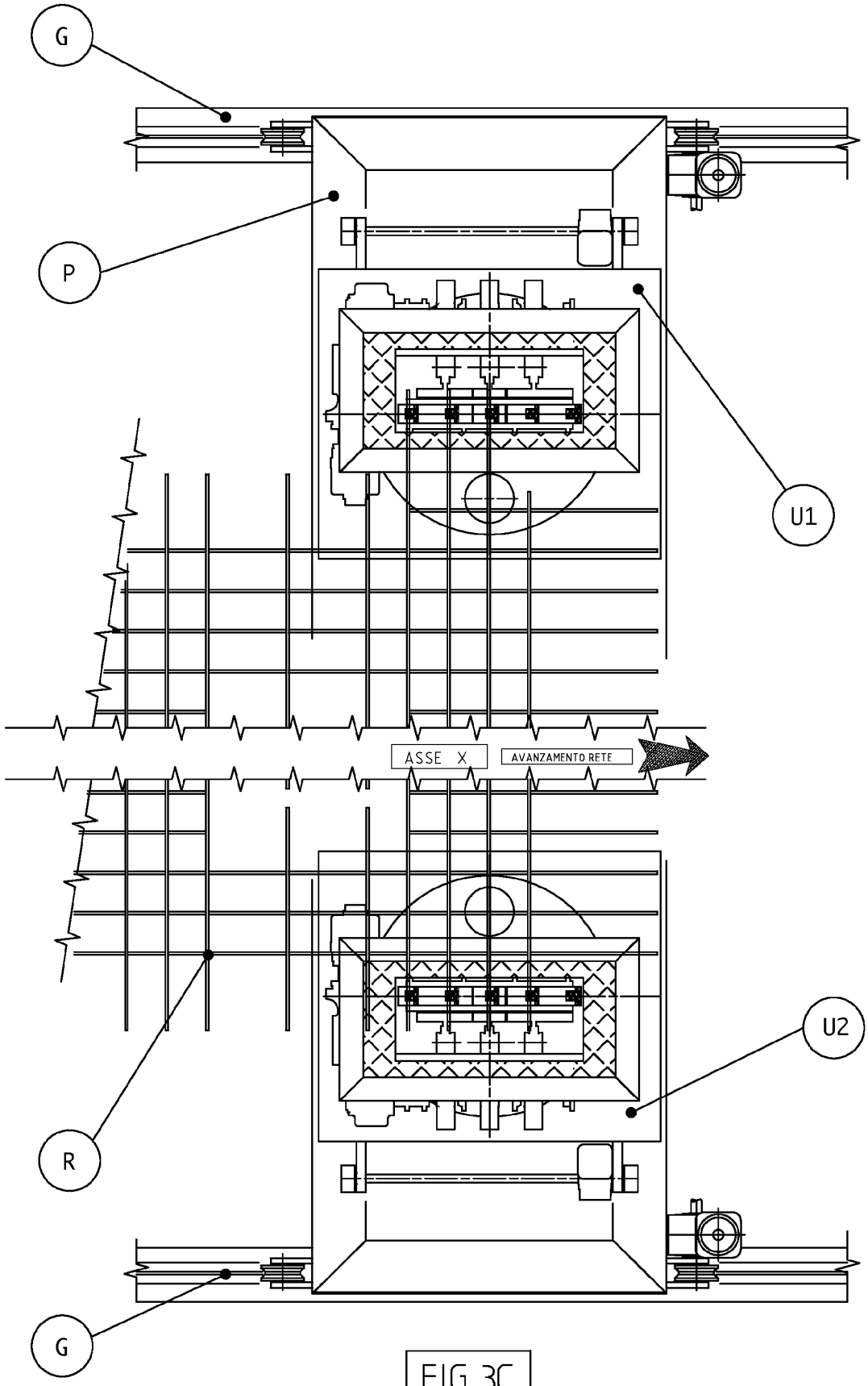

FIG. 3C

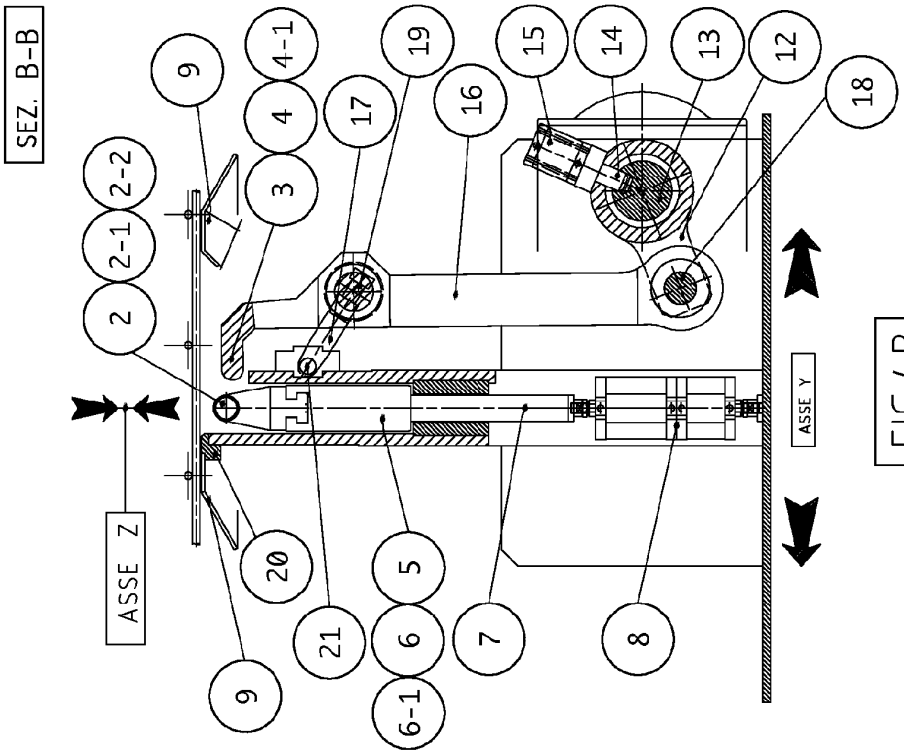
SEZ. B-B
9
4-1
4
3
19
17
16
15
14
13
12
18
2-2
2-1
2
ASSE Z
20
21
9
5
6
6-1
7
8
ASSE Y

FIG.4B

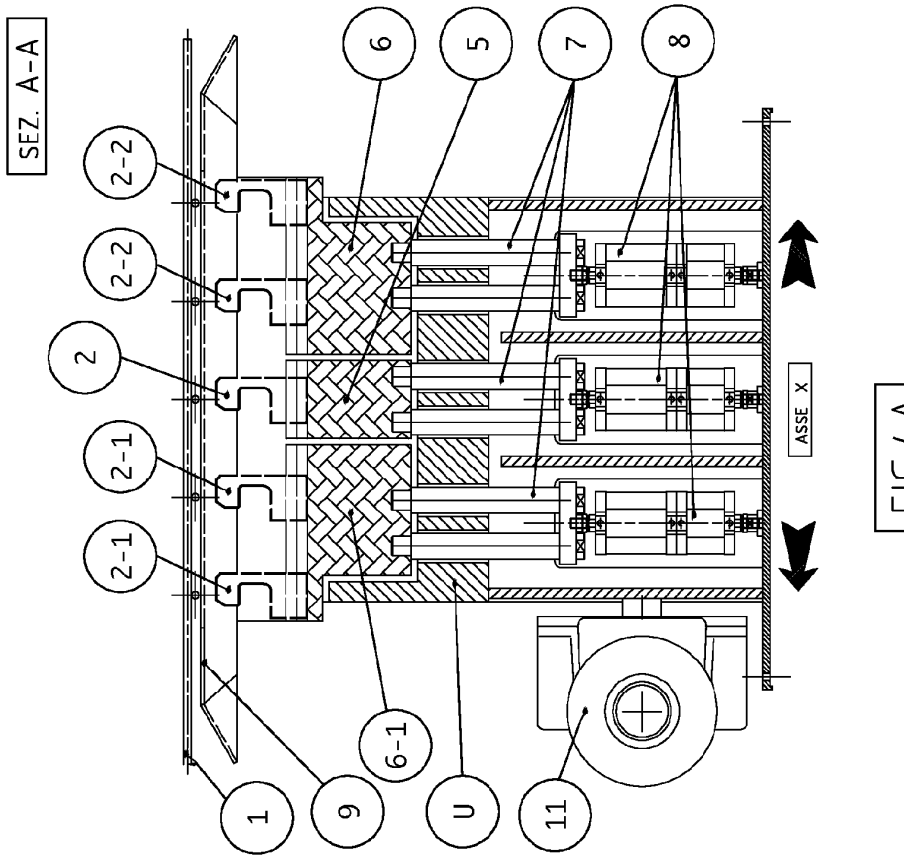
SEZ. A-A
6
5
7
8
2-2
2-2
2
2-1
2-1
ASSE X
6-1
1
9
U
11

FIG.4A

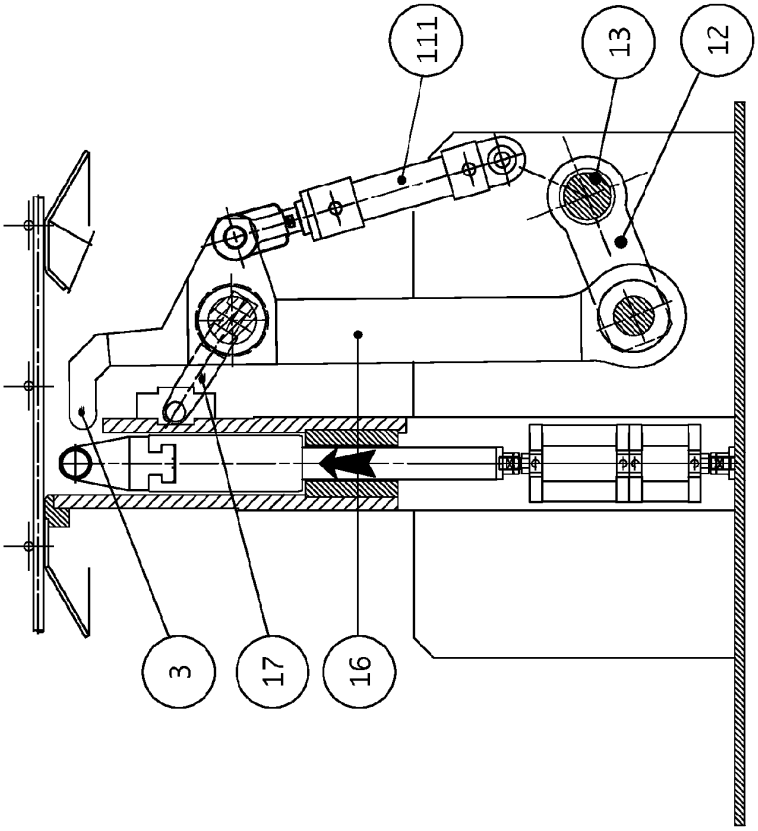

FIG.5B

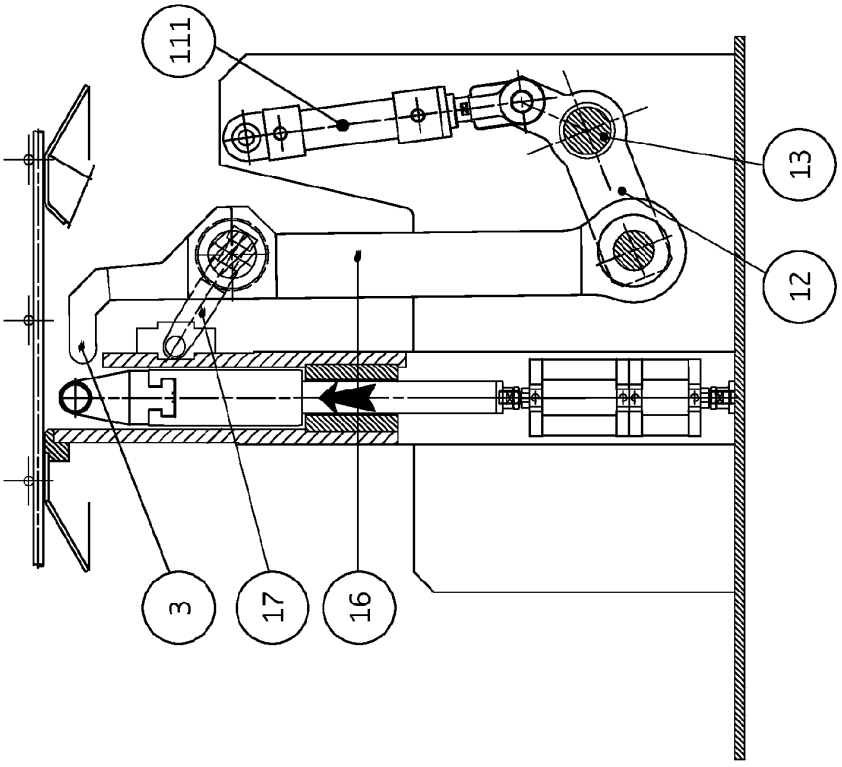

FIG.5A

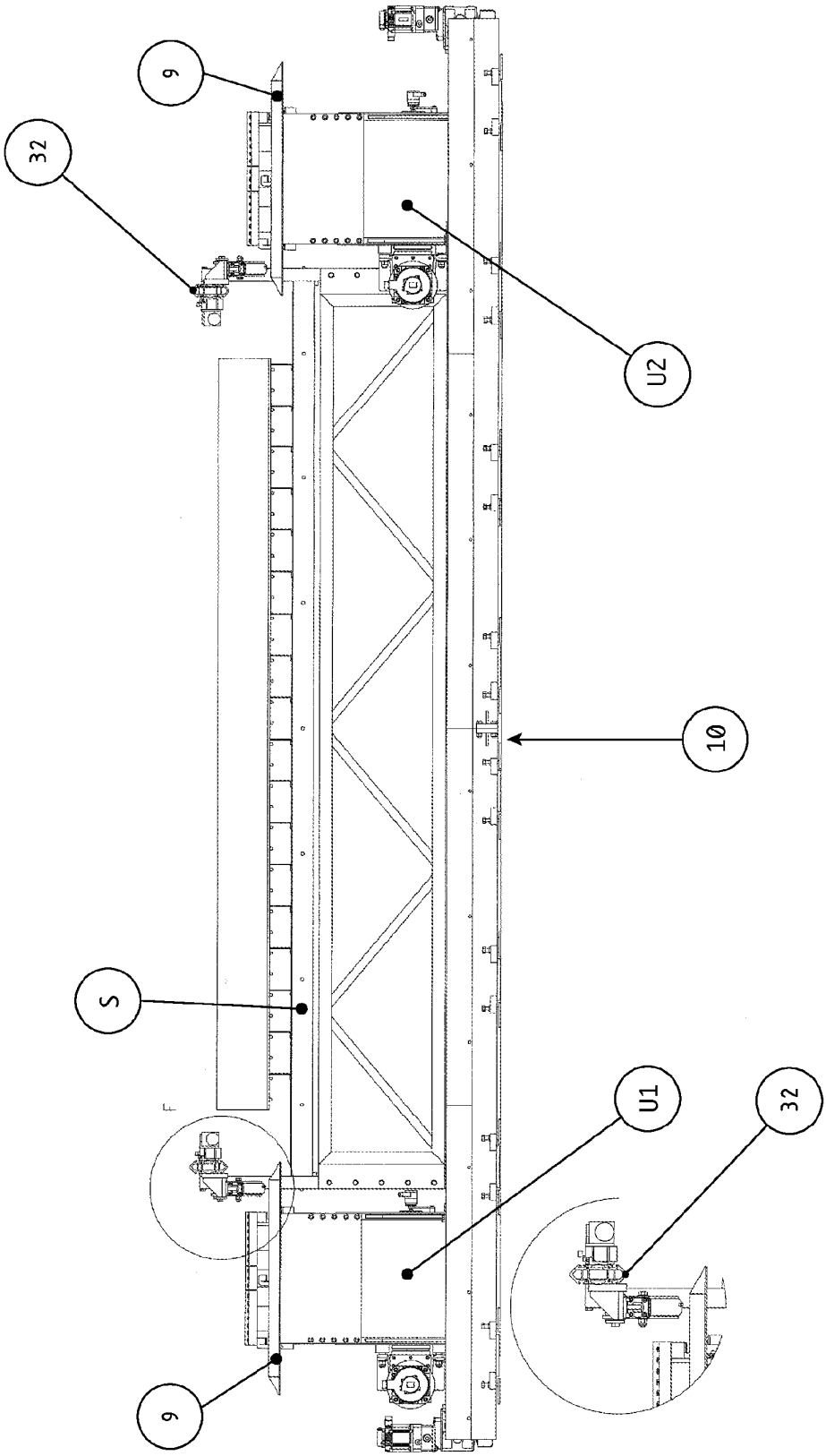

FIG.6A

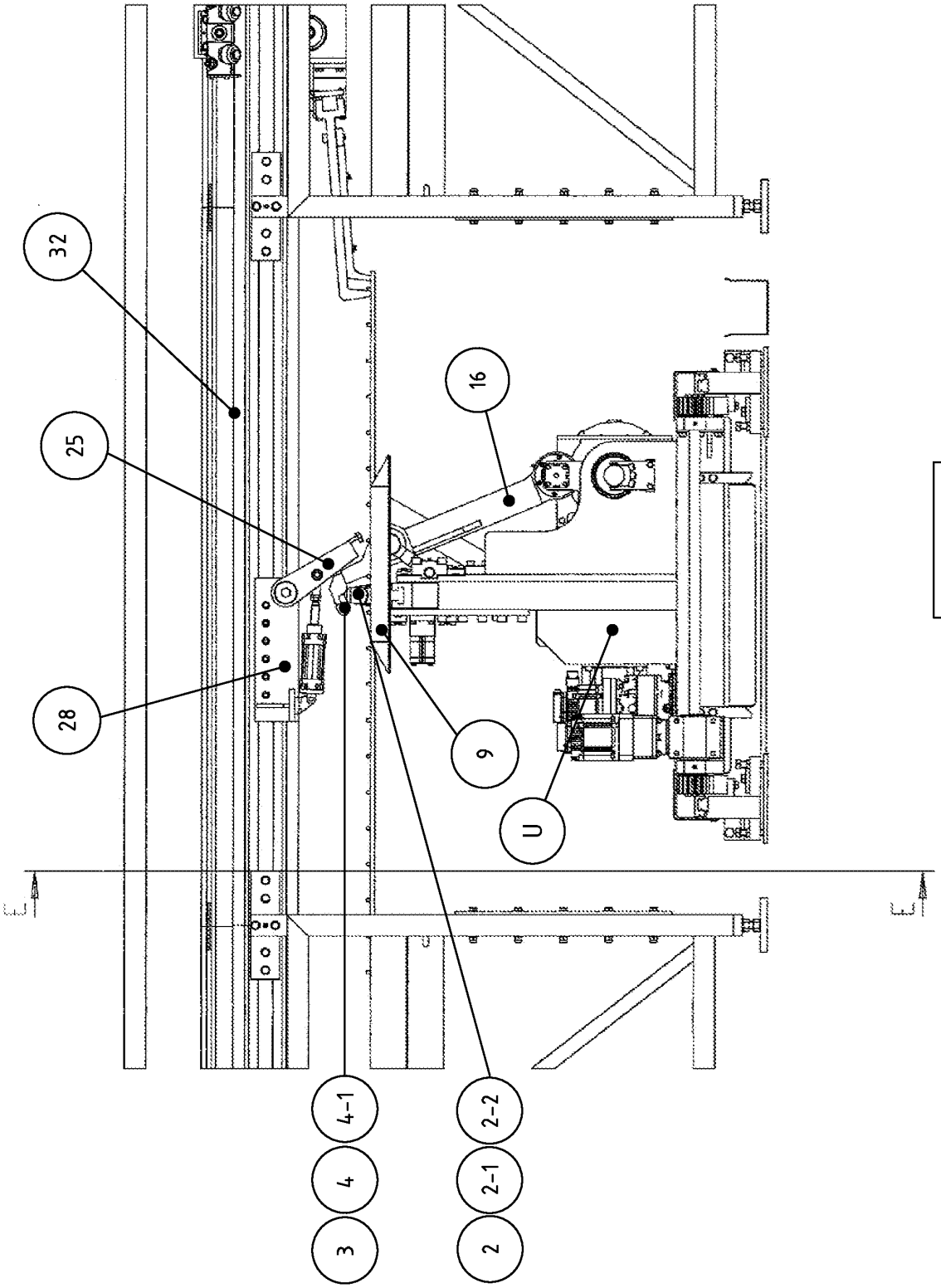

FIG.6B

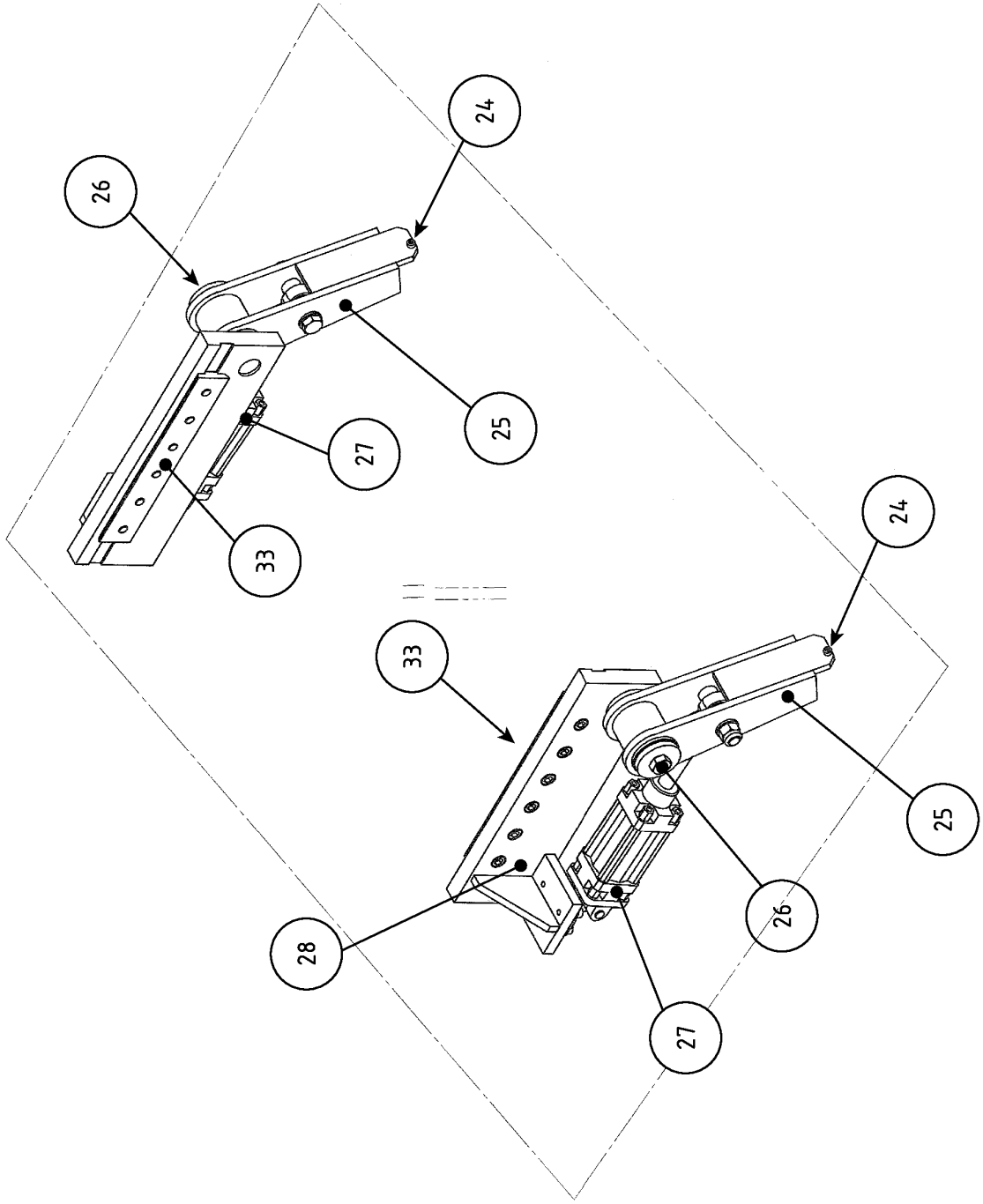

FIG.7

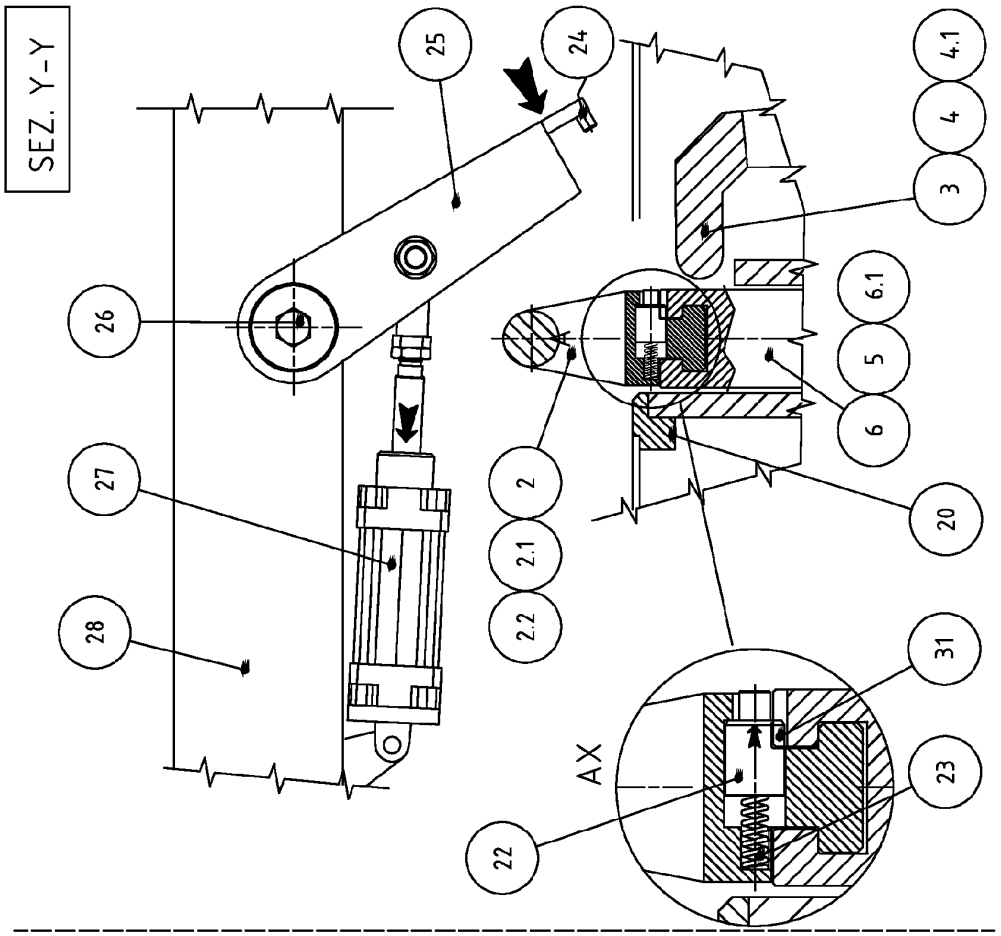
SEZ. Y-Y
25
24
4.1
4
3
26
6.1
5
6
2
2.1
2.2
20
27
28
31
23
AX
22

FIG.8B

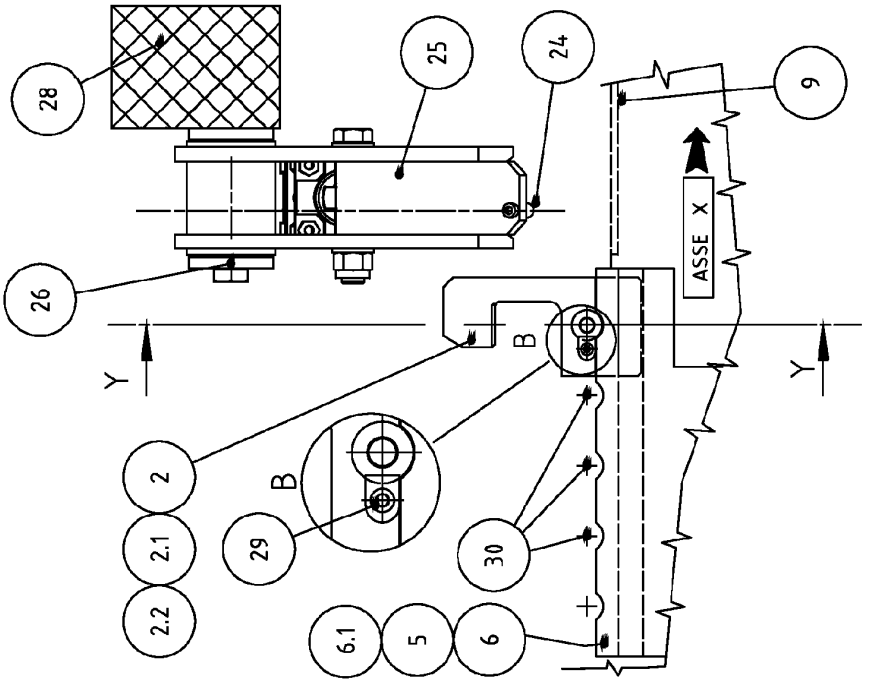
28
25
24
9
26
ASSE X
Y
Y
B
B
2
2.1
2.2
29
30
6.1
5
6

FIG.8A

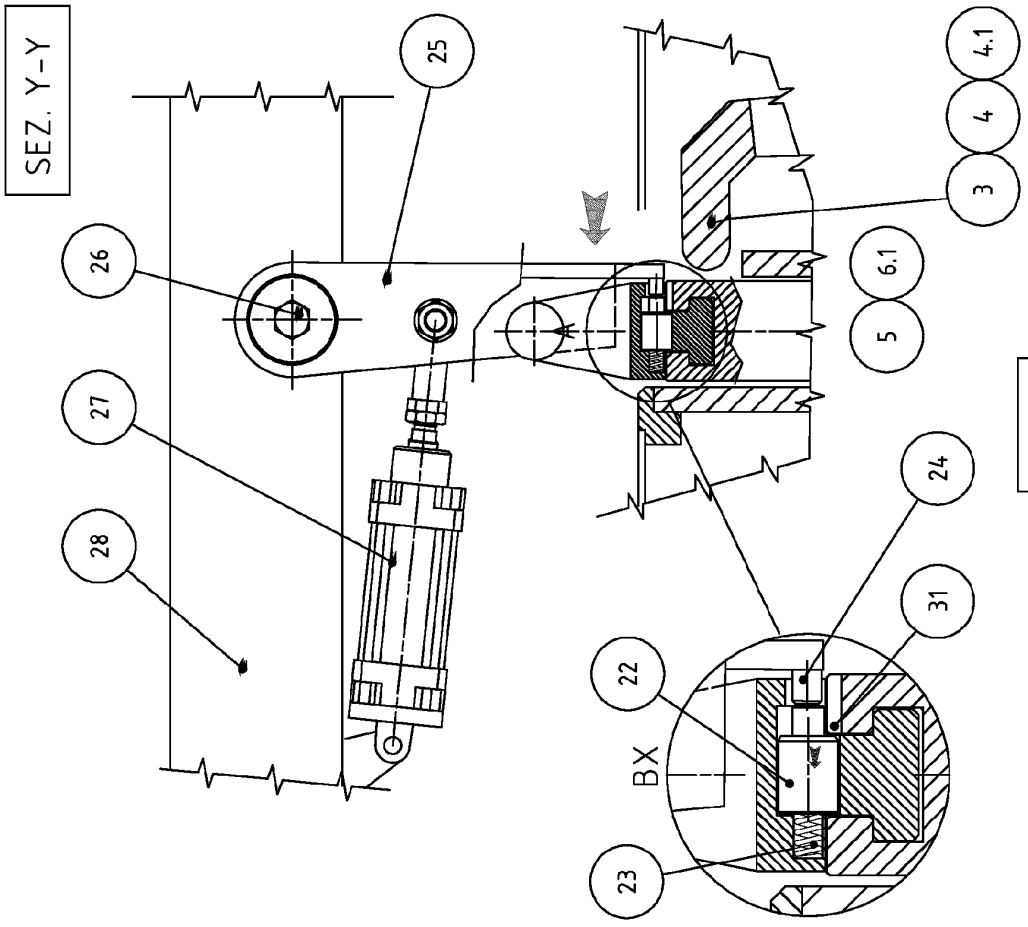

FIG.9B

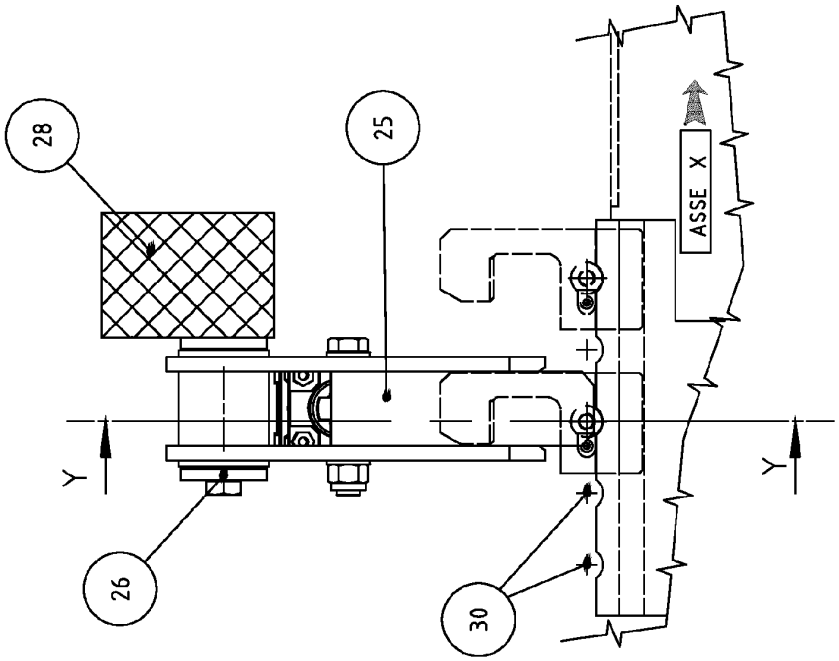

FIG.9A

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP S5135776 A **[0007]**