



(11) **EP 2 150 381 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
21.11.2012 Bulletin 2012/47

(51) Int Cl.:
B25H 7/04 (2006.01)

(21) Application number: **08766167.4**

(86) International application number:
PCT/KR2008/003205

(22) Date of filing: **09.06.2008**

(87) International publication number:
WO 2008/150143 (11.12.2008 Gazette 2008/50)

(54) **MARKING APPARATUS FOR USE IN SECTION STEEL CUTTING SYSTEM**

MARKIERUNGSVORRICHTUNG ZUR VERWENDUNG IN EINEM
STAHLABSCHNITTSSCHNEIDESYSTEM

APPAREIL DE MARQUAGE DESTINÉ À ÊTRE UTILISÉ DANS UN SYSTÈME DE DÉCOUPE
D'ACIER PROFILÉ

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT
RO SE SI SK TR**

(30) Priority: **07.06.2007 KR 20070055698**

(43) Date of publication of application:
10.02.2010 Bulletin 2010/06

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Description

Technical Field

[0001] The present invention relates to a marking apparatus for use in a section steel cutting system.

Background Art

[0002] In general, section steel is reinforcing material which is used for vertical and horizontal structural reinforcement of a ship and in the top portion of a marine plant.

[0003] In order to arrange and fix the reinforcing material on a structure of a ship in a desired form, a required process includes fabricating a plurality of pieces of section steel, having diverse dimensions or types, by cutting and welding a flat plate of steel, curve forming and/or cutting the fabricated section steel in a designated shape, sorting out the curve formed and/or cut section steel according to the installation position and the usage thereof, and transferring and storing the sorted section steel.

[0004] Since the section steel to be used in a ship has to be attached to a curved hull part, the cutting process includes procedures of cutting the bent section steel to correspond to a design specification, marking a non-linear curve onto the surface of the section steel, bending the same using a bending machine such that the curved marked line is made linear. The non-linear section steel requiring the cutting process amounts to about 20% of whole section steel.

[0005] In order to treat the great amount of the section steels, as shown in FIG. 1, in the cutting process, the section steel A is marked with a bending line A, various labels A2, and a frame line A3, using a conventional ink-jet type printing unit.

[0006] Referring to FIG. 2, there is shown a printing unit 20 has been used in a section steel cutting system. For example, the section steel cutting system is for the section steel A, which is disclosed in Korean Patent Registration No. 10-0633566 commonly owned by present applicant. The section steel cutting system, in addition to the printing unit 20, further includes a cross conveyor 1, a feeding roller 2, a carrier unit 10, a cutting unit 30, and a control room 50 having a control circuit 40.

[0007] Here, the cross conveyor 1 conveys the section steel A onto the feeding roller 2, and the carrier unit 10 carries the conveyed section steel A in the longitudinal direction of the section steel A to a cutting position.

[0008] The printing unit 20 carries out a marking process via the multiple marking steps, so as to form, on the section steel A, various printed marks including a bending line.

[0009] The printing unit 20 implements multi-axis movement, as in a multi-axis robot. For reference, the directions of the multi-axis movement are defined as follows: the X-axis direction of the multi-axis designates the feeding direction of the section steel A by the feeding

roller 2, the Y-axis direction designates a direction perpendicular to the X-axis direction and corresponding to the width direction of the section steel A, and the Z-axis direction designates the direction perpendicular to the X-Y plane and corresponding to the height direction of the cutting system.

[0010] However, the printing unit of the conventional section steel cutting system has defects of very slow working speed and reduced efficiency because a relatively great number of marking steps, such as line-printing operations (for a bending line, a frame line or the like), and label-printing operations must be carried out.

[0011] Further, in the conventional section steel cutting system, taking account of the fact that the section steel is arranged and carried such that a bent portion thereof faces upward according to its shape or type, the printing has to be performed onto an inclined surface of the section steel. However, since a separate complicated carrier device for erecting the section steel vertically is used so that the section steel corresponds to a printer head of the printing unit, working efficiency is degraded, and the section steel is not brought very close to the printer head, thereby greatly seducing marking precision and printing quality.

US 2007/0095218 A1 discloses an assembly for marking a pole transported by a conveyor, comprising a support frame located adjacent to at least a portion of the conveyor and at least one print head assembly for marking the pole, the at least one print head assembly including at least one print head, and wherein the at least one print head is moveably secured to the frame for selectively engaging the pole.

Disclosure of Invention

Technical Problem

[0012] An object of the present invention is to provide a marking apparatus of a section steel cutting system, in which a marking head assembly, having plural rows of ink-jet heads, is positioned close to a carrier unit according to the type of section steel, thereby implementing the marking in only one transportation step without requiring multiple marking steps.

Technical Solution

[0013] In accordance with an embodiment of the present invention, there is provided a marking apparatus for use in a section steel cutting system having a measuring robot and a conveyor unit, as disclosed in claim 1.

Advantageous Effects

[0014] According to the present invention as set forth above, the marking apparatus of the section steel cutting system has the carrier unit and the marking head assembly, which carry out the marking operation for various

lines, labels, and the like after being moved and rotated to correspond to the shape of the section steel, so that the marking is simultaneously done with a plurality of ink-jet heads, providing very rapid working speed and high working efficiency.

[0015] Further, the marking can be performed so as to correspond to diverse shapes of section steel even when using only the present cutting system via the primary rotation by a second actuator or the secondary rotation by a third actuator, to correspond to the shape of the printing surface of the section steel, which is arranged and carried. In particular, the marking accuracy and the printing quality are very high since the marking is done in the state in which vertical and horizontal guide rollers are driven while contacting the section steel.

Brief Description of the Drawings

[0016] The above and other objects and features of the present invention will become apparent from the following description of embodiments given in conjunction with the accompanying drawings, in which:

[0017] FIG. 1 is a perspective view illustrating section steel marked by a printing unit according to the prior art;

[0018] FIG. 2 is a view illustrating the construction of a section steel cutting system having the printing unit according to the prior art;

[0019] FIG. 3 is a front elevation view illustrating a section steel cutting system according to an embodiment of the present invention;

[0020] FIG. 4 is an exploded view for explaining the relationships between elements of the embodiment shown in FIG. 3;

[0021] FIG. 5 is a plan view of a marking head assembly shown in FIG. 4;

[0022] FIG. 6 is a front elevation view of a marking head assembly shown in FIG. 5;

[0023] FIG. 7 is a cross sectional view taken along line B-B of FIG. 6;

[0024] FIG. 8 is a cross sectional view taken along line C-C of FIG. 6; and

[0025] FIGS. 9 to 11 are front elevation views for explaining the operational relationships between elements of the embodiment shown in FIG. 4.

Mode for the Invention

[0026] Hereinafter, a detailed description will be made of exemplary embodiments of the present invention with reference to the drawings.

[0027] FIG. 3 is a front elevation view illustrating a section steel cutting system shown in FIG. 2 according to an embodiment of the present invention, FIG. 4 is an exploded view explaining the relationships between elements of the embodiment shown in FIG. 3, FIG. 5 is a plan view of the marking head assembly shown in FIG. 4, and FIG. 6 is a front elevation view of the marking head assembly shown in FIG. 5. Further, FIG. 7 is a side ele-

vation sectional view taken along line B-B of FIG. 6, FIG. 8 is a plan sectional view taken along line C-C of FIG. 6, and FIGS. 9 to 11 are front elevation views explaining the operational relationships between elements of the embodiment shown in FIG. 4.

[0028] As shown in FIG. 3, a marking apparatus of the present invention may be one of a plurality of modules or one of a plurality of components of a section steel cutting system shown in FIG. 2, which is positioned in front of the cutting unit of the section steel cutting system.

[0029] As example of the section steel cutting system is disclosed in Korean Patent Application No. 10-2007-0008683 commonly owned by the present applicant, and includes a designing system, an off-line programming (OLP) system, a monitoring system, a section steel input unit, a robot controller, and a reporting system.

[0030] The robot controller serves to control a measuring robot 80 having a robot arm 81, a conveyor unit 90 having at least an infeed conveyor, and a printing unit, all of which are organically associated.

[0031] Before the detailed description, the portion related to the general technology will now be described.

[0032] The measuring robot 80 receives the section steel A in the order of a working process according to the operation of the infeed conveyor.

[0033] The section steel A is arranged such that a relatively short part thereof faces a vertical conveyor roller 91 of the conveyor unit 90 and a relatively long part thereof (e.g., a printing surface) is slanted and disposed on a horizontal conveyor roller 92. Thus, the section steel is conveyed along the conveyor unit 90 while a bent part of the section steel faces upward.

[0034] The section steel A has tens of defined dimensions according to the purpose and use thereof.

[0035] In the meantime, the measuring robot 80 operates according to instructions from the above-mentioned robot controller.

[0036] The measuring robot 80 checks the dimension and position of the received section steel A using the robot arm 81, moves the section steel A to the working position of the present embodiment P, carries out the setting for printing, and moves the section steel A in the X-axis direction during printing in association with the present embodiment P.

[0037] The marking apparatus of the present embodiment P operates according to the instructions from the robot controller, and simultaneously marks a bending line, a frame line and a label onto the surface of the section steel A, in association with the measuring robot 80.

[0038] To this end, the marking apparatus of the present embodiment P includes a carrier unit 100 for performing horizontal movement and rotation to correspond to the shape or kind of the section steel A, and a marking head assembly 200, having a plurality of rows of ink-jet heads, such as first, second and third ink-jet heads, which will be described later, which are installed on an end-side connection block of the carrier unit 100, so as to move or rotate close to the section steel A, and print a plurality

of lines and labels without multiple marking steps.

[0039] Each ink-jet head has a size large enough to come into surface contact with the greater part of the area of the large section steel A.

[0040] First, the carrier unit 100 has a base frame 110, in which a plurality of axial members is erected parallel with each other on the ground, and a cantilever is coupled to an upper portion thereof.

[0041] Here, the base frame 110 is installed on the ground around the measuring robot 80 with respect to the position in front of the cutting unit of the section steel cutting system, and is preferably fixed on the ground so as to withstand the load applied.

[0042] In order to collect discharged ink during maintenance, cleaning or the like, by nature of the ink-jet printing, a hopper type waste-ink recovery section 111, which has an opening valve, such as a cock, is preferably installed on the base frame 110 below the marking head assembly 200.

[0043] The relationships between elements of the present embodiment P will now be described with reference to FIG. 4.

[0044] As illustrated in FIG. 4, the cantilever 112 of the base frame 110 is provided with a first actuator 113 in the extension direction thereof so as to horizontally move the marking head assembly 200, as well as the elements for diverse movements or rotations, to the upper portion of the section steel A (see FIG. 3) to be marked.

[0045] All of the actuators to be mentioned later, including the first actuator 113, are controlled by the above-mentioned robot controller, and by nature of factory automation, they may of course be designed as a known reciprocal movement device (e.g., a known reciprocating device in which an electric motor, a ball-screw, a linear guide, a chain, a belt, a pulley, a shaft motor having a permanent magnet type shaft and a moving coil, a cable carrier, a hose, and so on are incorporated to achieve the reciprocal movement).

[0046] For example, the first actuator 113 includes a cylinder fixed to the cantilever 112, an operating arm 114 reciprocally coupled to the inside of the cylinder, a linear rail 115, installed on the upper surface of the cantilever 112, and a plurality of linear blocks 116 sliding along the linear rail.

[0047] A movable frame 120 is mounted on the linear blocks 116.

[0048] The movable frame 120 includes a horizontal beam 121, supported by the linear blocks 116, an upper beam 122 extending upward from the upper surface of the left end side of the horizontal beam 121, and a lower beam 123, extending downward from the under surface of the left end side of the horizontal beam 121.

[0049] The lower beam 123 is coupled, on its side, to the end of the operating arm 114 of the first actuator 113 so as to transmit the reciprocating force of the first actuator 113 to the movable frame 120.

[0050] In this case, the movable frame 120 can be carried on the cantilever 112 of the base frame 110 by the

linear blocks 116 and the linear rail 115.

[0051] In view of the above, the first actuator 113 serves to horizontally move the marking head assembly 200 to the upper portion of the section steel.

[0052] Meanwhile, the upper beam 122 is provided on its side with a hinge joint 124.

[0053] A middle portion of a cylinder of a second actuator 125 is hinged to the hinge joint 124.

[0054] The second actuator 125 serves to primarily rotate the marking head assembly 200, which has been horizontally moved to the upper portion of the section steel, to thereby tilt it to correspond to the shape of the section steel.

[0055] To this end, an operating arm 126 of the second actuator 125 is arranged to face a "y" shaped link member 130, and is coupled to an upper joint 131 of the link member 130.

[0056] The link member 130 includes a center joint 132 of rotation in the left side and a connection joint 133 in the right side.

[0057] The center joint 132 of the link member 130 is rotatably coupled to a bearing block 127, which is formed in the end portion of the lower beam 123 of the movable frame 120.

[0058] The reciprocating movement of the operating arm 126 of the second actuator 125 allows the connection joint 133 of the link member 130 to rotate with respect to the center joint 132 of rotation and the bearing block 127.

[0059] Further, the end side of a cylinder of a third actuator 140 is hinge-coupled near the upper joint 131 of the link member 130.

[0060] The third actuator 140 serves to secondarily rotate the marking head assembly 200, which has been primarily tilted, so that the marking head assembly is secondarily tilted closer to the shape of the section steel.

[0061] To this end, an operating arm 141 of the third actuator 140 is arranged to face a door-shaped support frame 150, and is coupled to a knuckle joint 152, which is eccentric from a connection joint-installation hole 151 of the support frame 150, in the right upper side direction with respect to the upper portion of the support frame 150.

[0062] The support frame 150 is able to rotate together with the marking head assembly 200 and a hanger frame 160 to be described later, with respect to the connection joint 133 to be coupled with the installation hole 151.

[0063] A plurality of linear blocks 153 is mounted on the support frame 150.

[0064] In the upper left portion of the support frame 150, a cylinder of a fourth actuator 154 is mounted.

[0065] An operating arm 155 of the fourth actuator 154 is connected with the hanger frame 160.

[0066] Here, the linear blocks 153 of the support frame 150 are coupled with a linear rail 161 of the hanger frame 160, so that the hanger frame 160 is movable according to the operation of the operation arm 155 of the fourth actuator 154.

[0067] On the hanger frame 160, an end side connection block 162, as mentioned above, is fixed.

[0068] Further, in the lower portion, or in the left lower portion, more preferably, of the hanger frame 160, at least one vertical guide roller 163 is further mounted so as to roll along the relatively short part of the section steel.

[0069] Furthermore, in the lower portion of the support frame 150, a horizontal guide roller 158, which rolls along the relatively long part of the section steel, and a cover 159 are mounted.

[0070] It is preferable that the support frame 150 or the hanger frame 160 be further provided with a plurality of proximity sensors 157 and 169 for detecting the control state of operation.

[0071] For example, the proximity sensor 169, mounted on the hanger frame 160, serves to detect the proximity state between the vertical guide roller 163 and the section steel.

[0072] Alternatively, a LDS(laser distance sensor) may be used as the vertical and horizontal guide roller 163 and 158. The LDS can accurately and fastly measure the distance with the section steel without contacting the section steel. Measured data is used to control the support frame 150 and the hanger frame 160 to be guided along the section steel while maintaining predetermined distance. In this case, rollers may be disposed in the vicinity of the section steel near the LDS to prevent the LDS from colliding with the section steel by accident.

[0073] Referring to FIGS. 5 and 6, the marking head assembly 200 has a hanger bracket 201, connected with the end side connection block 162 of FIG. 4, which is described above.

[0074] The hanger bracket 201 is an element having a cross-sectional shape resembling an inverted T, and corresponds to the base frame of the marking head assembly 200.

[0075] The marking head assembly 200 includes single-dot type first and third ink-jet heads 210 and 230, arranged in a pair in opposite lower portions of the hanger bracket 201, and an 80-dot type second ink-jet head 220, disposed between the first and third ink-jet heads 210 and 230.

[0076] The first, second, and the third ink-jet heads 210, 220, and 230 are adapted to perform the marking while being individually moved relative to the hanger bracket 201 by respective linear modules.

[0077] As for the linear module, for example, the first and third ink-jet heads 210 and 230 use the known ball-screw assembly and linear guide, which are operated by the corresponding drive motors 211 and 231, as shown in FIG. 5, and mark various lines in the state of being mounted on and moved via corresponding support members 212 and 232 of FIG. 7, which are mounted on the moving block of the ball-screw assembly.

[0078] Further, the second ink-jet head 220 also uses the known ball-screw assembly and linear guide, which are directly connected with the corresponding drive motor 221 as shown in FIG. 7 or 8, and marks labels or the like in a state of being mounted on and moved via corresponding support members 222 of FIG. 7, which are

mounted on the moving block of the ball-screw assembly.

[0079] Now the operational relationships between elements of the present invention will be described with reference to FIGS. 3, 4, and 9 to 11.

5 **[0080]** First, as shown in FIG. 3, the measuring robot 80 sets the corresponding section steel A to an initial position, at which the marking starts, via the operation in combination with the conveyor unit 90.

10 **[0081]** Then, the carrier unit 100 is operated by the robot controller so as to horizontally move and rotate the marking head assembly 200 to bring it closer to the relatively long part of the section steel A.

[0082] To be specific, the first actuator 113, shown in FIG. 4, advances its operating arm 114 so as to horizontally move the movable frame 120 and all the elements mounted thereon, particularly such that the marking head assembly 200 is brought near the upper portion of the section steel A, as shown in FIG. 9.

15 **[0083]** In FIG. 9, then the second actuator 125 also advances its operating arm downward.

[0084] In this case, the link member 130, connected with the operating arm 126 of the second actuator 125, is primarily rotated (T1) with respect to the center joint 132 of rotation, as shown in FIG. 10.

20 **[0085]** In FIG. 10, the horizontal guide roller 158 becomes closer to the relatively long part of the section steel A, whereas the vertical guide roller 163 may not become closer to the relatively short part of the section steel A.

25 **[0086]** In this case, as the fourth actuator 154 stops using the corresponding proximity sensor 169 after the operation F, the entire hanger frame 160 supported by the support frame 150 is finally moved so that the vertical guide roller 163 also comes closer to the relatively short part of the section steel A, as shown in FIG. 11.

30 **[0087]** Further, it is natural for the third actuator 140 to be further operated so as to perform the secondary rotation T2 according to the type of the section steel A.

35 **[0088]** In this state, the measuring robot moves the section steel A on the conveyor unit 90 from the initial position to the final position, at which the marking is done. In the course of a single movement step, the horizontal and vertical guide rollers 158 and 163 are driven while coming closer to the section steel A. Further, the first, second, and third ink-jet heads of the marking head assembly 200 are simultaneously operated to carry out the marking of various lines and labels one time. Then, the link member 130 and the marking head assembly 200 are reversely rotated to return to their stand-by positions.

40 **[0089]** Although preferred embodiments of the present invention have been described for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope of the invention as disclosed in the accompanying claims.

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Claims

1. A marking apparatus for use in a section steel cutting system, including a measuring robot (80) and a conveyor unit (90), the marking apparatus comprising:

a carrier unit (100) for performing the horizontal movement and rotation to correspond to a shape of a section steel (A) on the conveyor unit (90); and a marking head assembly (200) mounted on an end portion connection block of the carrier unit (100) and having a plurality of ink-jet heads (210, 220, 230) for performing a printing at a closer position to the section steel (A), wherein the carrier unit (100) comprises:

a base frame (110) mounted on ground around the measuring robot (80);
a movable frame (120), horizontally movable based on the base frame (110);
a first actuator (113) for operating the movable frame (120);
a second actuator (125), hinged to an upper portion of the movable frame (120);
a link member (130), coupled with an operating arm (126) of the second actuator (125) so as to be rotated with respect to a center joint (132) of rotation, hinged to a lower portion of the movable frame (120);
a support frame (150), coupled via a connection joint (133), formed in the link member (130);
a fourth actuator (154) mounted in an upper left portion of the support frame (150); and
a hanger frame (160), coupled with an operating arm (155) of the fourth actuator (154) so as to horizontally move based on the support frame (150), and having the end portion connection block for mounting the marking head (200) assembly.

2. The marking apparatus according to claim 1, wherein the carrier unit (100) further comprises a third actuator (140), coupled between the link member (130) and the support frame (150), using a knuckle joint of the support frame (150).
3. The marking apparatus according to claim 1, wherein the carrier unit (100) further comprises a horizontal guide roller (158), mounted on the lower portion of the support frame (150) to roll along a relatively long part of the section steel (A).
4. The marking apparatus according to claim 3, wherein the horizontal guide roller (158) includes one or more laser distance sensors (LDSs).
5. The marking apparatus according to claim 1, wherein

the carrier unit (100) further comprising at least one vertical guide roller (163), mounted on the lower portion of the hanger frame (160) so as to roll along a relatively short part of the section steel (A).

6. The marking apparatus according to claim 5, wherein the vertical guide roller (163) includes one or more laser distance sensors (LDSs).
7. The marking apparatus according to claim 1, wherein the marking head assembly (200) further comprises: a hanger bracket (201), connected with the end portion connection block; and a plurality of linear modules (211, 221, 231), coupled so as to individually move the plurality of ink-jet heads (210, 220, 230), based on the hanger bracket (201).
8. The marking apparatus according to claim 1, wherein the plurality of ink-jet heads includes: first (210) and third (230) ink-jet heads of single-dot type, disposed in a pair arrangement in opposite lower portions of the hanger bracket (201); and a second ink-jet head (220) of multi-dot type, disposed between the first (210) and third (230) ink-jet heads.

Patentansprüche

1. Eine einen Messroboter (80) und eine Fördereinheit (90) aufweisende Markierungsvorrichtung für die Verwendung in einer Profilstahl-Schneideinrichtung, wobei die Markierungsvorrichtung aufweist:

eine Trägereinheit (100) zum Ausführen der horizontalen Bewegung und Drehung, um einer Form eines Profilstahls (A) auf der Fördereinheit (90) zu entsprechen;
und eine Markierkopfeinrichtung (200), welche an einem Endabschnitt-Verbindungsblock der Trägereinheit (100) montiert ist und eine Mehrzahl von Tintenstrahl-Köpfen (210, 220, 230) zum Durchführen eines Druckens an einer dem Profilstahl (A) näheren Position aufweist, wobei die Trägereinheit aufweist:

ein Untergestell (110), welches auf dem Boden um den Messroboter (80) herum montiert ist;
einen beweglichen Rahmen (120), der gestützt auf das Untergestell (110) horizontal bewegbar ist;
einen ersten Aktuator (113) zum Bedienen des beweglichen Rahmens (120);
einen zweiten Aktuator (125), der an einem oberen Abschnitt des beweglichen Rahmens (120) gelenkig gelagert ist;
ein an einem unteren Abschnitt des beweglichen Rahmens (120) gelenkig gelagertes

- Verbindungsbauteil (130), welches mit einem Betriebsarm (126) des zweiten Aktuators (125) verbunden ist, um in Bezug auf einen Verbindungs-Drehpunkt (132) gedreht zu werden,
- 5 einen Stützrahmen (150), der mittels einer in dem Verbindungsbauteil (130) ausgebildeten Anschlussverbindung (133) angekoppelt ist;
- 10 einen vierten Aktuator (154), der in einem oberen linken Abschnitt des Stützrahmens (150) montiert ist; und
- einen Hängerrahmen (160), welcher mit einem Betriebsarm (155) des vierten Aktuators (154) gekoppelt ist, um sich, gestützt auf den Stützrahmen (150), horizontal zu bewegen, und welcher den Endabschnitt-Verbindungsblock zum Montieren der Markierkopfeinrichtung (200) aufweist.
2. Die Markierungsvorrichtung gemäß Anspruch 1, wobei die Trägereinheit (100) ferner einen dritten Aktuator (140) aufweist, welcher zwischen dem Verbindungsbauteil (130) und dem Stützrahmen (150) angekoppelt ist, indem eine Gelenkverbindung des Stützrahmens (150) genutzt wird.
- 25 3. Die Markierungsvorrichtung gemäß Anspruch 1, wobei die Trägereinheit (100) ferner eine horizontale Führungsrolle (158) aufweist, welche an dem unteren Abschnitt des Stützrahmens (150) montiert ist, um entlang eines relativ langen Teils des Profilstahls (A) zu rollen.
- 30 4. Die Markierungsvorrichtung gemäß Anspruch 3, wobei die horizontale Führungsrolle (158) einen oder mehr Laser-Abstandssensoren (LDS) aufweist.
- 35 5. Die Markierungsvorrichtung gemäß Anspruch 1, wobei die Trägereinheit (100) ferner mindestens eine vertikale Führungsrolle (163) aufweist, welche an dem unteren Abschnitt des Hängerrahmens (160) montiert ist, um entlang eines relativ kleinen Teils des Profilstahls (A) zu rollen.
- 40 6. Die Markierungsvorrichtung gemäß Anspruch 5, wobei die vertikale Führungsrolle (163) einen oder mehr Laser-Abstandssensoren (LDS) aufweist.
- 45 7. Die Markierungsvorrichtung gemäß Anspruch 1, wobei die Markierkopfeinrichtung (200) ferner aufweist: einen mit dem Endabschnitt-Verbindungsblock verbundenen Hängerhalter (201); und eine Mehrzahl von auf den Hängerhalter (201) gestützten Linearmodulen (211, 221, 231), welche angekoppelt sind, um die Mehrzahl von Tintenstrahlköpfen (210, 220, 230) individuell zu bewegen.
- 50 55

8. Die Markierungsvorrichtung gemäß Anspruch 1, wobei die Mehrzahl von Tintenstrahl-Köpfen aufweist: einen ersten (210) und einen dritten (230) Tintenstrahl-Kopf vom Einzelpunkt-Typ, welche in einer paarweisen Anordnung in entgegengesetzten unteren Abschnitten des Hängerhalters (201) angeordnet sind; und einen zweiten (220) Tintenstrahl-Kopf vom Mehrfachpunkt-Typ, der zwischen dem ersten (210) und dem dritten (230) Tintenstrahl-Kopf angeordnet ist.

Revendications

1. Appareil de marquage pour une utilisation dans un système de coupe d'acier profilé, comprenant un robot de mesure (80) et une unité de transport (90), l'appareil de marquage comprenant :

une unité de support (100) pour exécuter le mouvement horizontal et la rotation afin de correspondre à une forme d'un acier profilé (A) sur l'unité de transport (90) ;

et un ensemble de tête de marquage (200) monté sur un bloc de raccordement de partie d'extrémité de l'unité de support (100) et ayant une pluralité de têtes à jet d'encre (210, 220, 230) pour exécuter une impression à une position plus proche de l'acier profilé (A), dans lequel l'unité de support (100) comprend :

un cadre de base (110) monté sur le sol autour du robot de mesure (80) ;

un cadre mobile (120), horizontalement mobile basé sur le cadre de base (110) ;

un premier actionneur (113) pour actionner le cadre mobile (120) ;

un deuxième actionneur (125), articulé sur une partie supérieure du cadre mobile (120) ;

un élément de liaison (130), raccordé à un bras opérationnel (126) du deuxième actionneur (125) de manière à être mis en rotation par rapport à une jonction centrale (132) de rotation, articulée sur une partie inférieure du cadre mobile (120) ;

un cadre de support (150), raccordé via une jonction de raccordement (133), formée dans l'élément de liaison (130) ;

un quatrième actionneur (154) monté dans une partie supérieure gauche du cadre de support (150) ; et

un cadre de suspension (160), couplé avec un bras opérationnel (155) du quatrième actionneur (154) de manière à se déplacer horizontalement basé sur le cadre de support (150), et ayant le bloc de raccordement de partie d'extrémité pour monter l'ensemble

de tête de marquage (200).

2. Appareil de marquage selon la revendication 1, dans lequel l'unité de support (100) comprend en outre un troisième actionneur (140), raccordé entre l'élément de liaison (130) et le cadre de support (150), en utilisant une genouillère du cadre de support (150). 5

3. Appareil de marquage selon la revendication 1, dans lequel l'unité de support (100) comprend en outre un rouleau de guidage horizontal (158), installé sur la partie inférieure du cadre de support (150) pour rouler le long d'une partie relativement longue de l'acier profilé (A). 10
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4. Appareil de marquage selon la revendication 3, dans lequel le rouleau de guidage horizontal (158) comprend un ou plusieurs détecteurs de distance laser (LDS). 20

5. Appareil de marquage selon la revendication 1, dans lequel l'unité de support (100) comprend en outre au moins un rouleau de guidage vertical (163), monté sur la partie inférieure du cadre de suspension (160) de manière à rouler le long d'une partie relativement courte de l'acier profilé (A). 25

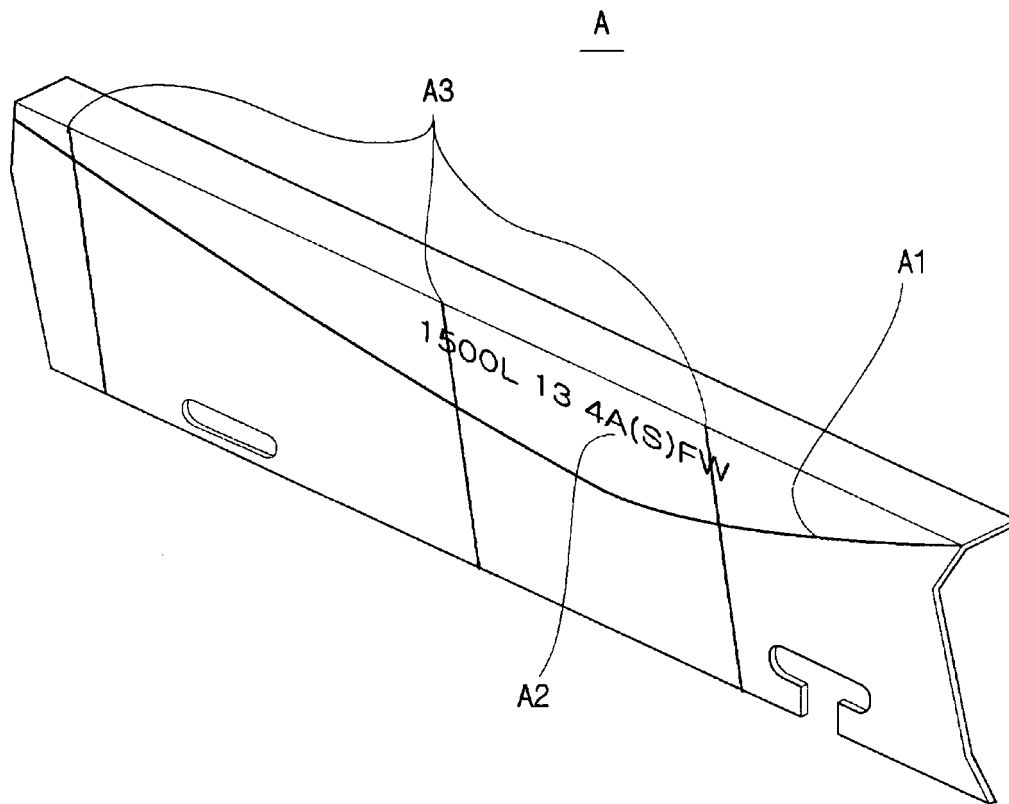
6. Appareil de marquage selon la revendication 5, dans lequel le rouleau de guidage vertical (163) comprend un ou plusieurs détecteurs de distance laser (LDS). 30

7. Appareil de marquage selon la revendication 1, dans lequel l'ensemble de tête de marquage (200) comprend en outre : une console de suspension (201), raccordée au bloc de raccordement de partie d'extrémité ; et une pluralité de modules linéaires (211, 221, 231), raccordés de manière à déplacer individuellement la pluralité de têtes à jet d'encre (210, 220, 230), basé sur la console de suspension (201). 35
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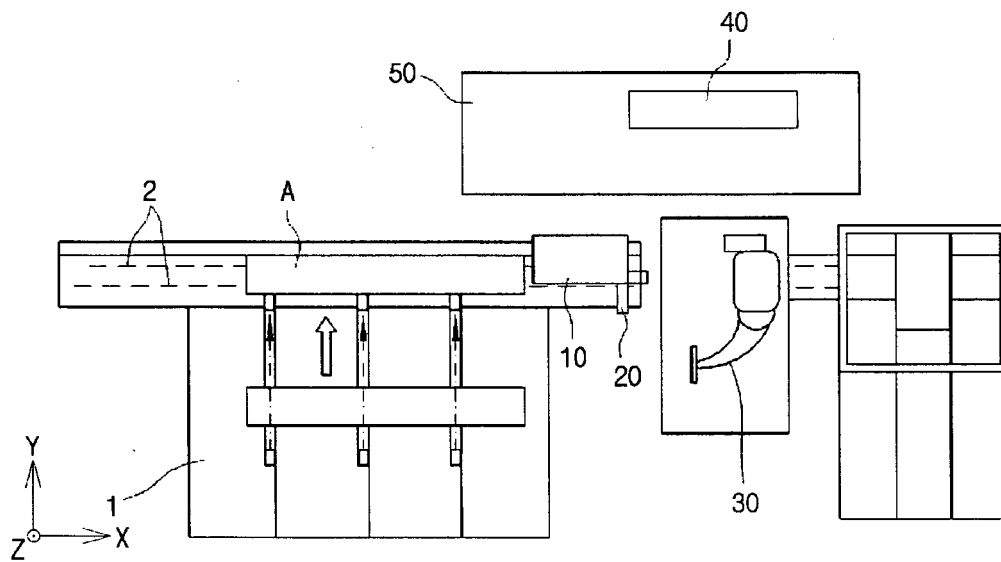
8. Appareil de marquage selon la revendication 1, dans lequel la pluralité de têtes à jet d'encre comprend : des première (210) et troisième (230) têtes à jet d'encre de type monopoint, disposée dans un agencement de paire dans des parties inférieures opposées de la console de suspension (201) ; et une deuxième tête à jet d'encre (220) de type multipoint, disposée entre les première (210) et troisième (230) têtes à jet d'encre. 45
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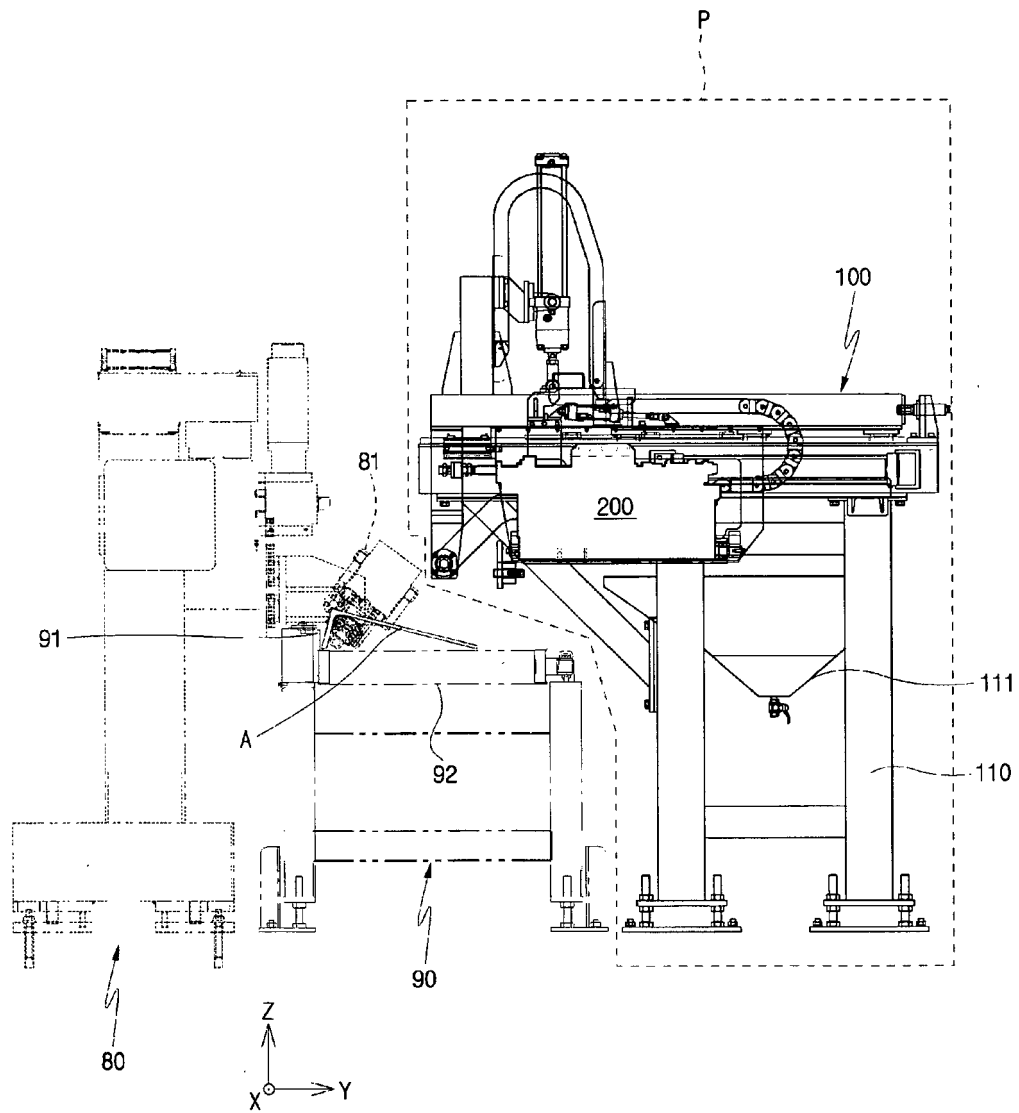
[Fig. 1]



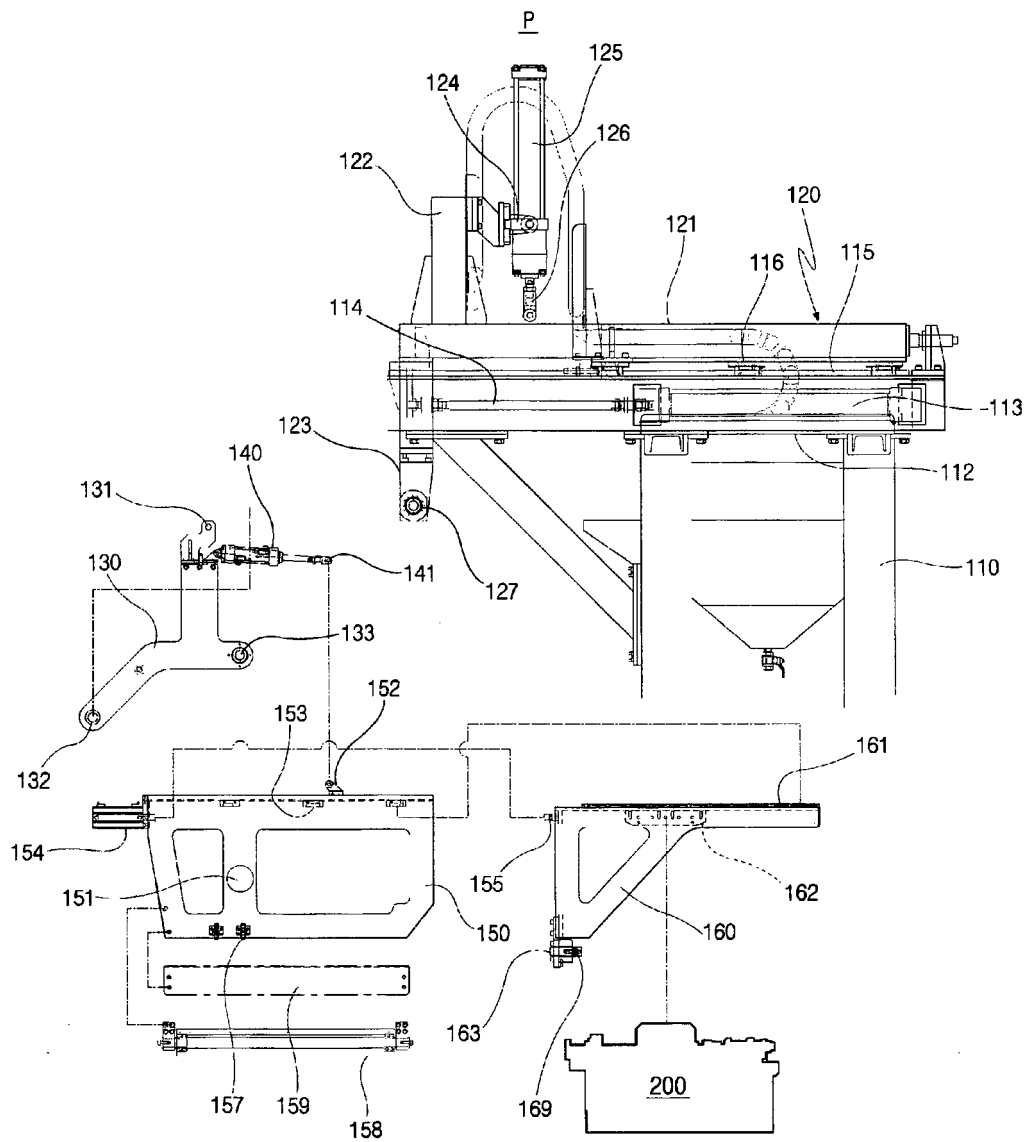
[Fig. 2]



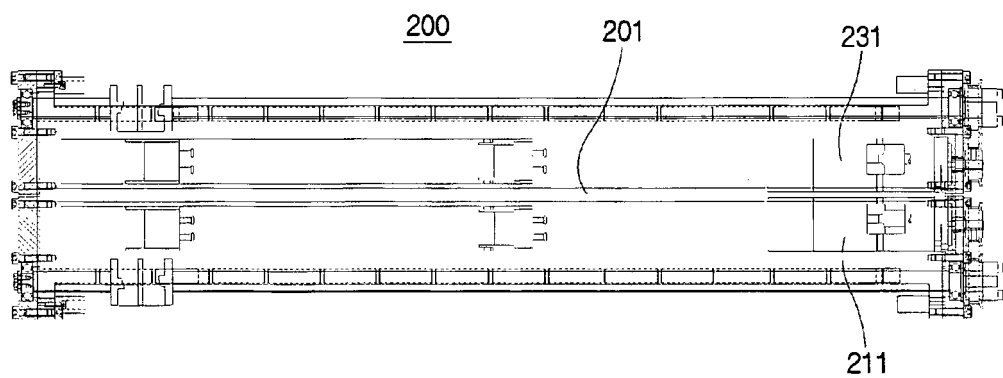
[Fig. 3]



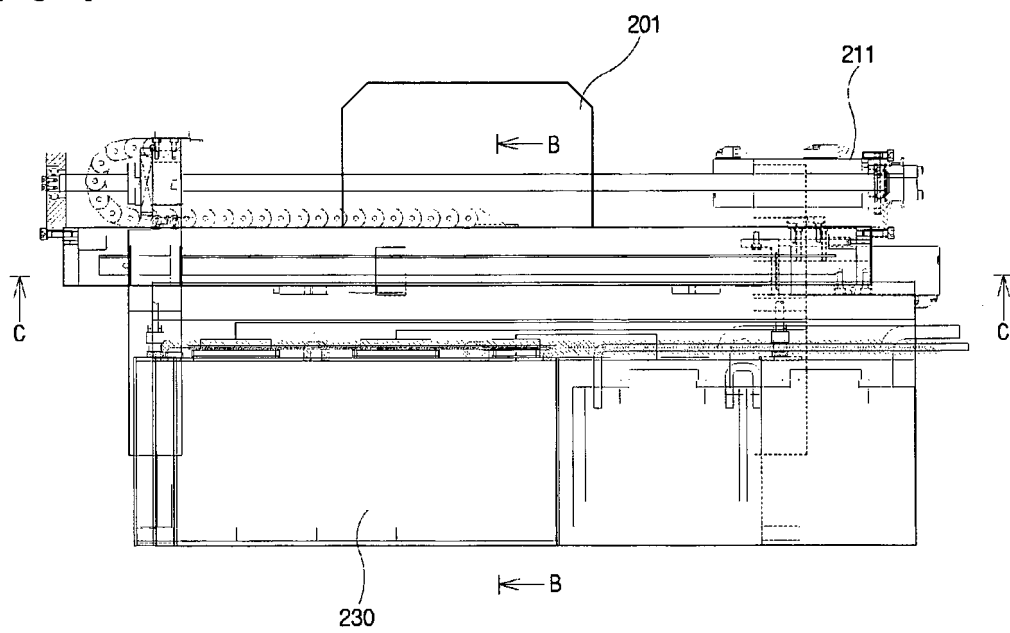
[Fig. 4]



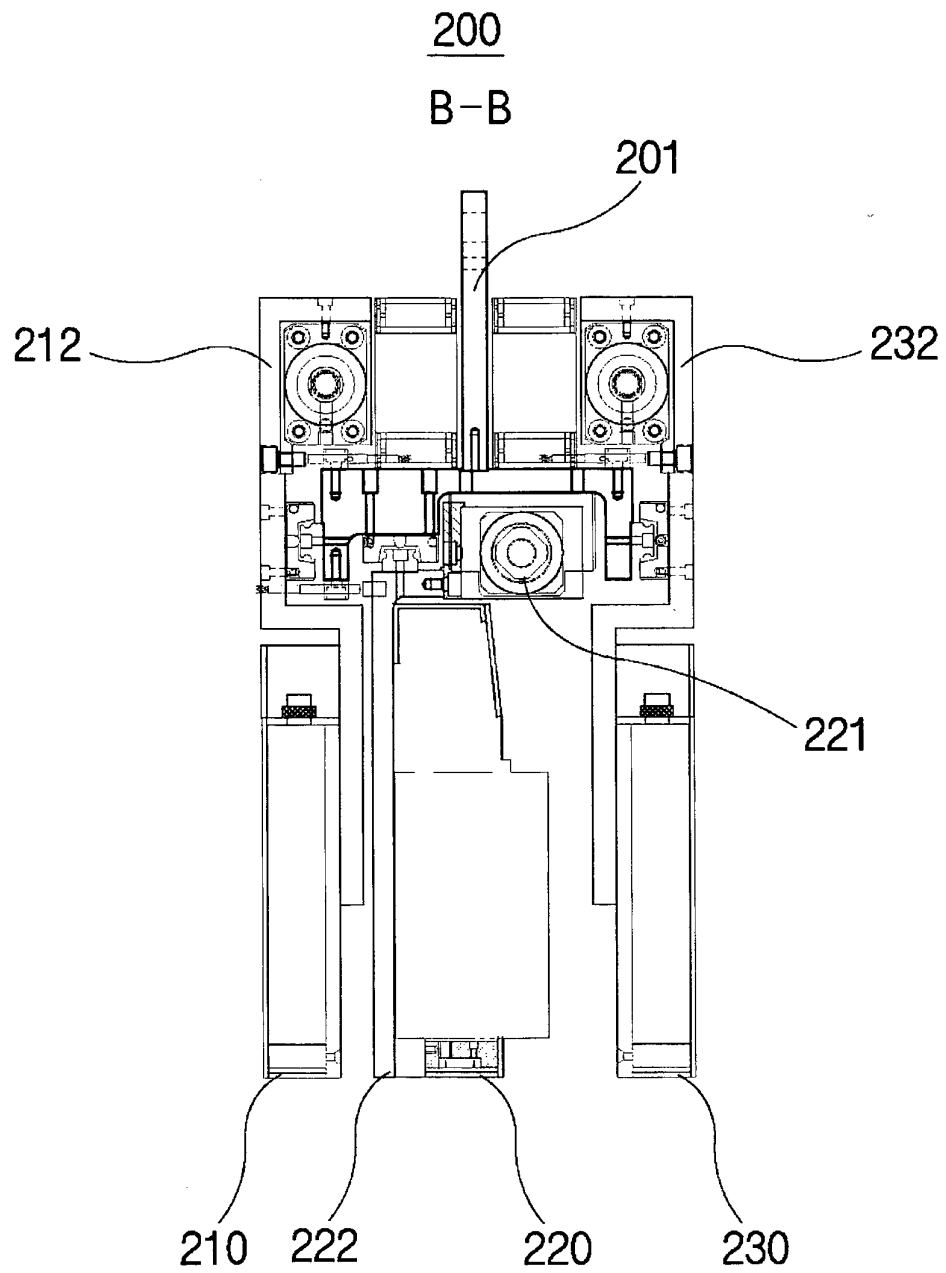
[Fig. 5]



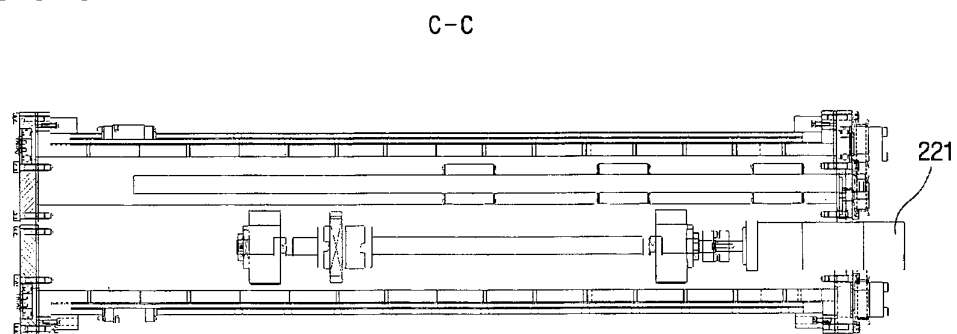
[Fig. 6]



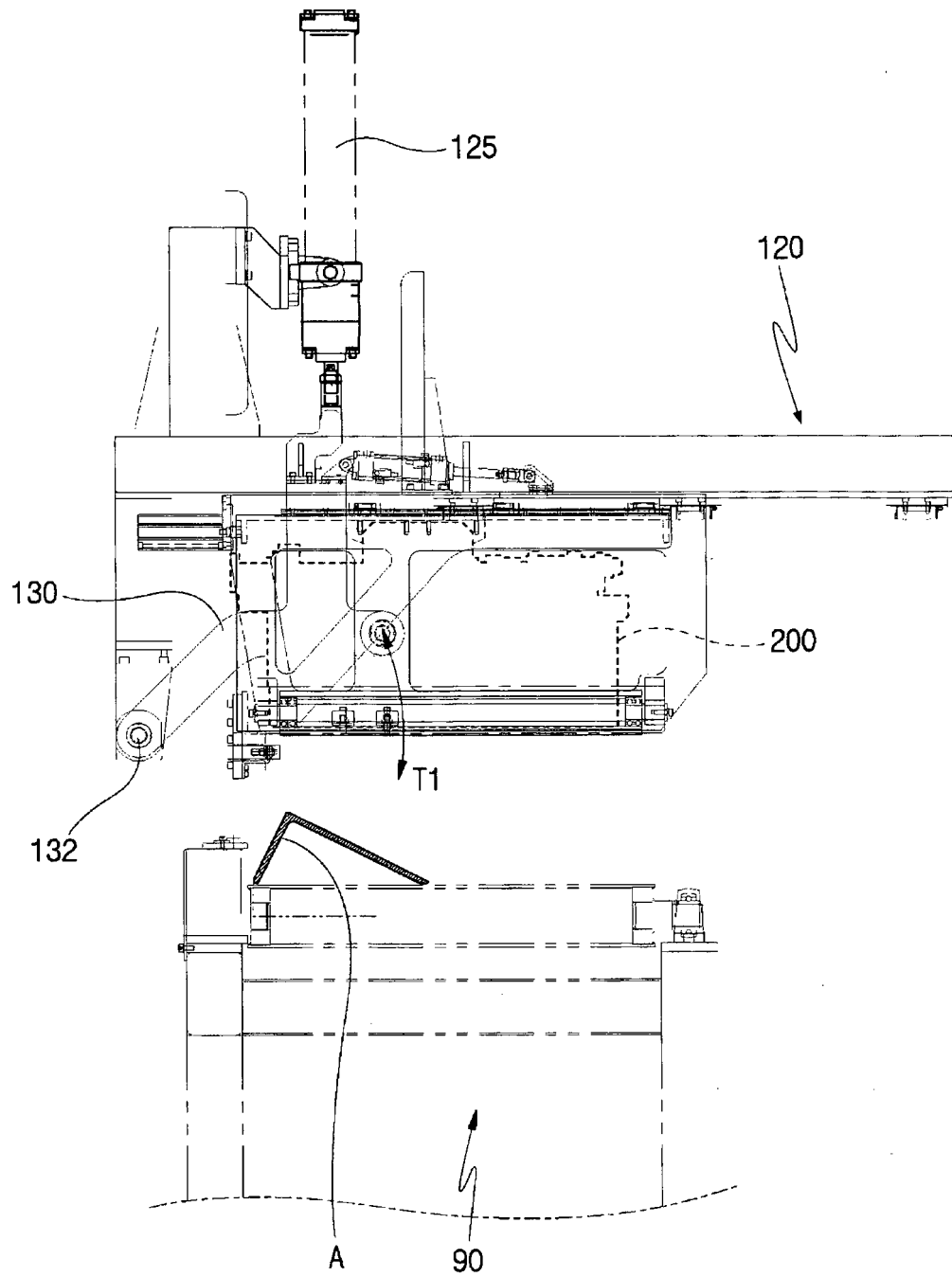
[Fig. 7]



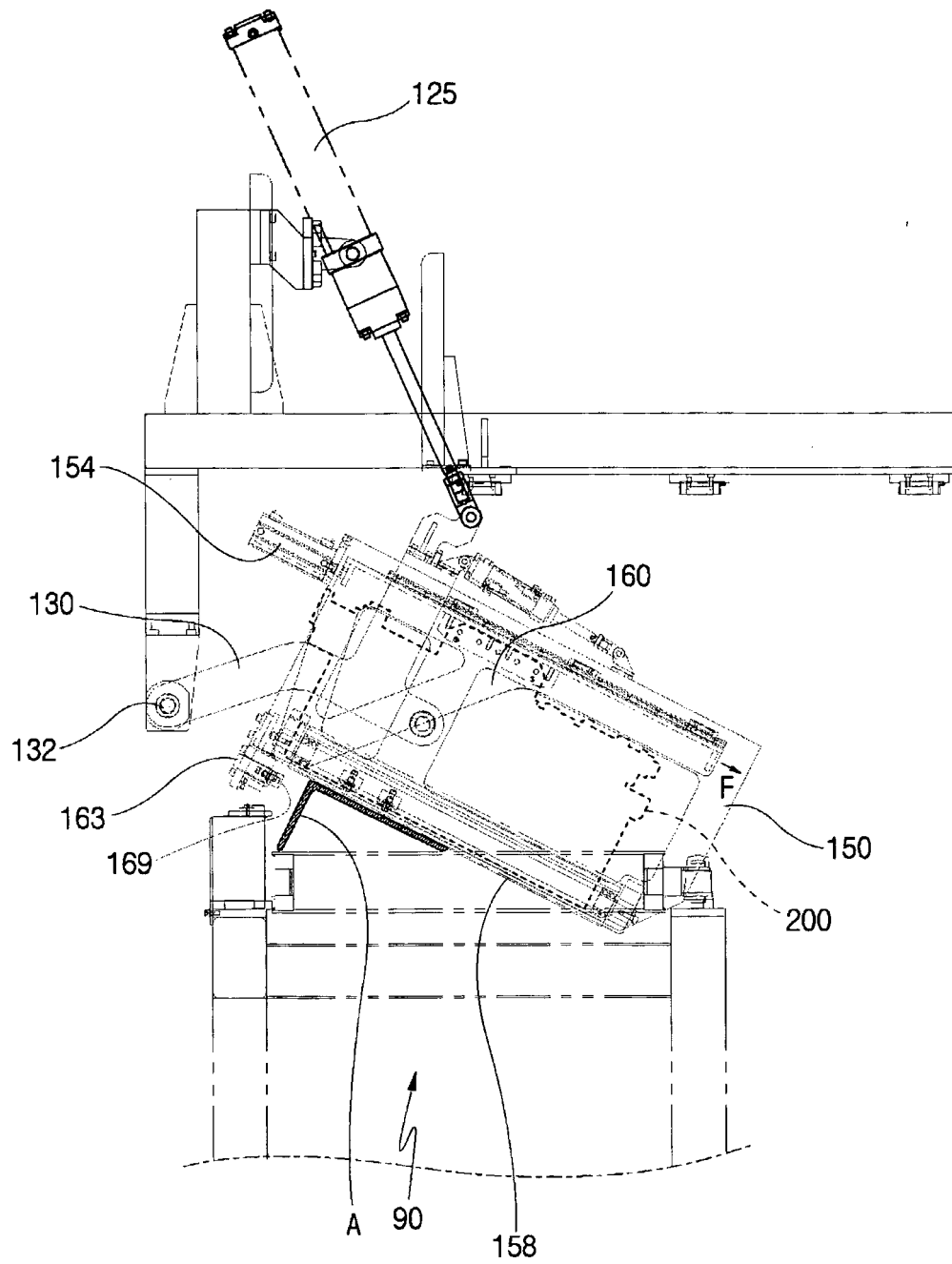
[Fig. 8]



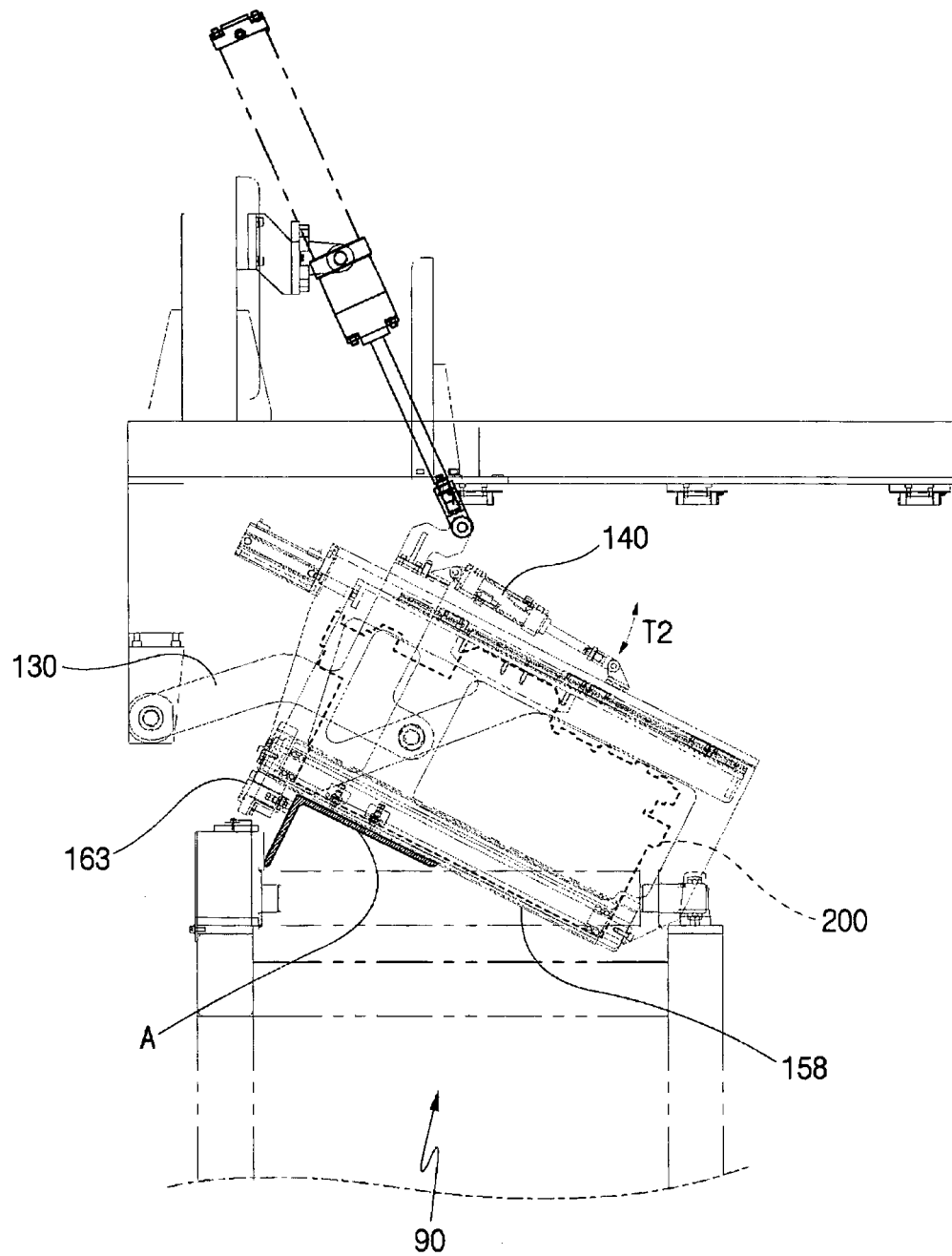
[Fig. 9]



[Fig. 10]



[Fig. 11]



REFERENCES CITED IN THE DESCRIPTION

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