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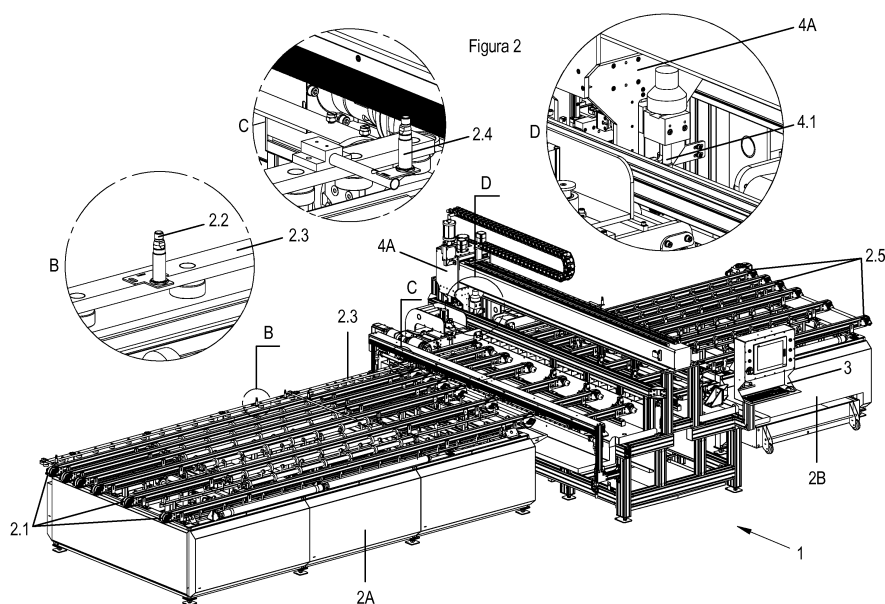
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(30) Priority: **20.06.2016 BR 202016015301 U**

(54) **WATER JET MACHINE FOR CUTTING FLAT GLASS**

(57) This request for an invention patent is oriented to the industrial sector and refers to a water jet cutting machine used in plate glass cutting, with the horizontal cut being made with high pressure focused water combined with abrasive elements in order to make holes and cutouts on plate glass. Its unique characteristic when compared to the water jet cutting machines existing in the market is the possibility of operating in an automated production line, with glass pieces feed, automatic shoulder milling and referencing. This format meets the demands of the glass market with high productivity and pro-

duction standardization. The purpose of the water jet cutting machine for plate glass cutting is to drill holes and make cutouts in an automatic way, on or in plate glass with several lengths, widths and thicknesses, specially by means of positioning tools and machining (hole and/or cuts) functional movements, configured for the functionalities of the cutting head (4), input conveyor belts (2.1) and output conveyor belts (5.1), specially by the positioning and synchronized functional movements during the drilling or cutting of a specific piece.



Description

[0001] This request for an invention patent is oriented to the industrial sector and refers to a water jet cutting machine used in plate glass cutting, with the horizontal cut being made with high pressure focused water combined with abrasive elements in order to make holes and cutouts on plate glass. Its unique characteristic when compared to the water jet cutting machines existing in the market is the possibility of operating in an automated production line, with glass pieces feed, automatic shoulder milling and referencing. This format meets the demands of the glass market with high productivity and production standardization.

[0002] By means of a fluid ultra-high pressure abrasive jet. Abrasive particles are aspired and directed from a pressurized source against the plate glass. Currently, the market offers several configuration of machines for plate glass cutting and reaming, both for machines equipped with milling cutter and for water jet combined with abrasive elements. Although they are pretty practical, such machines always depend on ancillary equipment to convey the glass and place it under the cutting head for the plate glass cutting or reaming. And the cutting head always operates in three axis (X, Y and Z) while the plate remains static during cutting.

[0003] In relation to the state of the art, document US4703591 describes a system for simple highspeed cuttings in raw glass with different thicknesses. For the initial penetration into the glass, the pressurized source is kept in the first level of pressure in which the grass is initially cut through without any unduly fractures or chips in the cutting point and the abrasive fluid flow can be advanced throughout the desired path in relation to the glass at a first speed.

[0004] Although it performs the task according to its specifications, the ultra-high pressure water jet does not have any automated means to grab and place the plate glass under the cutting head; it demands the aid of, at least, four people to place the glass on the cutting table. The aspect of the piece may be compromised due to scratches resulting from this process. Another gap of the equipment is about the cutting head, which operates in three axis (X, Y and Z). It may lead to imprecision if the head is not perfect calibrated or if the piece involuntarily moves during the process.

[0005] This invention patent aims at offering the market a new technology capable of cutting or reaming glass pieces in a more precise, automated and safe way, with no damage to the pieces, specially scratches caused by other techniques. This objective came from the lack of automated water jets with abrasives and from the gaps detected in the current state of art.

[0006] The description that follows below aims at highlighting the proposal, based on its principle, without any limitations to the diagram or component models, and referring to the following images:

Figure 1, schematic drawing representing the water jet cutting machine for plate glass cutting (front view);
Figure 2, view in perspective of the machine, detailing its main mechanic and electronic components;

[0007] According to figures 1 and 2, the water jet cutting machine for plate glass cutting (1) is composed of an input table (2) with input conveyor belts (2.1) placed along its longitudinal path and moved along axle X, photoelectric sensors (2.2) (detail B) and shoulder milling rule (2.3) with its sensor (2.4) (detail C); computerized system (3) for data storage in the supervisory: pieces measures, its cutouts and positions; cutting head (4) (detail A and D) with focusing nozzle (4.1) horizontally moving along axle Y and vertically moving along axle Z, and, finally, an output table (5) equipped with output conveyor belts (5.1) placed lengthwise in the equipment.

[0008] The operation of the water jet cutting machine for plate glass cutting (1) starts in the input table (2) which, by means of the input conveyor belts (2.1), receives the plate glass from previous processing, moves it and ends the task with the automatic shoulder milling of the piece on the milling rule (2.3) and the removal by means of photoelectric sensors (2.2). In this initial stage, the operator checks the piece bar code generated from the design developed with a dedicated CAD software. The machine stores piece measures, its cutouts and positions in the supervisory. Still, in respect to the input conveyor belts (2.1), the piece to be drilled or shoulder milled is moved to the machine loading area, where the second sensor (2.4) makes the belts retrieve and move the piece to the axle referencing mechanism responsible for finding the piece's origin point. The machine now starts the cutting process, moving the piece on the input conveyor belts (2.1) along axle X, while the main cutting head (4) performs the cutting movements along axle Y, bringing close or pulling back the focusing nozzle (4.1) along axle Z, with a combination of these axis and the interpolation of movements in an efficient and coordinated way, via PLC, as predefined by the CAD software scheme.

[0009] The cut is made due to the high pressure of a pumping intensifier system in an external unit integrated to the machine, which sends to the focusing nozzle a water jet with abrasive elements that cuts the plate glass. After the machine cuts all defined designs, the piece is moved by the input conveyor belts (2.1) to the output conveyor belts (5.1), which belong to the output table (5) that can be connected to other machine in the processing of the plate glass.

[0010] The purpose of the water jet cutting machine for plate glass cutting is to drill holes and make cutouts in an automatic way, on or in plate glass with several lengths, widths and thicknesses, specially by means of positioning tools and machining functional movements (hole and/or cuts), configured for the functionalities of the cutting head (4), input conveyor belts (2.1) and output conveyor belts (5.1), specially by the positioning and synchronized functional movements during the drilling or cut-

ting of a specific piece.

[0011] The water jet cutting machine for plate glass cutting performs the horizontal with high pressure water combined with abrasive elements in order to make holes and cutouts on plate glass. Its unique characteristic when compared to the water jet cutting machines existing in the market is the possibility of operating in an automated production line, with glass pieces feed, automatic shoulder milling and referencing, which demonstrates high productivity and production standardization.

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Claims

1. "Flat glass cutting waterjet machine", **characterized by** horizontal cutting using high water pressure and abrasives to drill holes and cutouts in flat glass sheets, works in automated production line, with feed, squaring and automatic referencing of high productivity and standardization of the production process.
2. A water jet machine for flat glass cutting according to one of the claims 1 **characterized by** an automated and computerized process.

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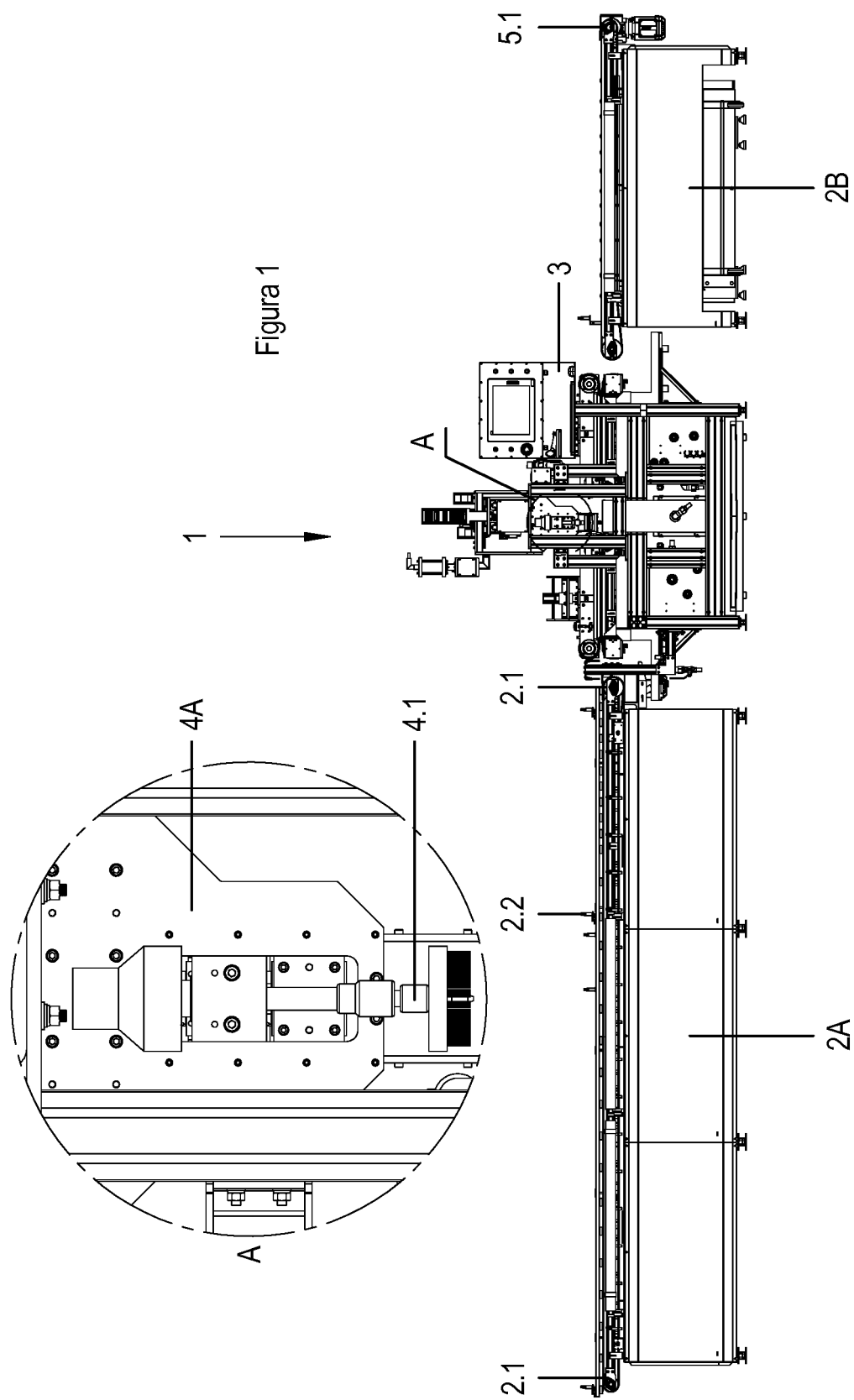
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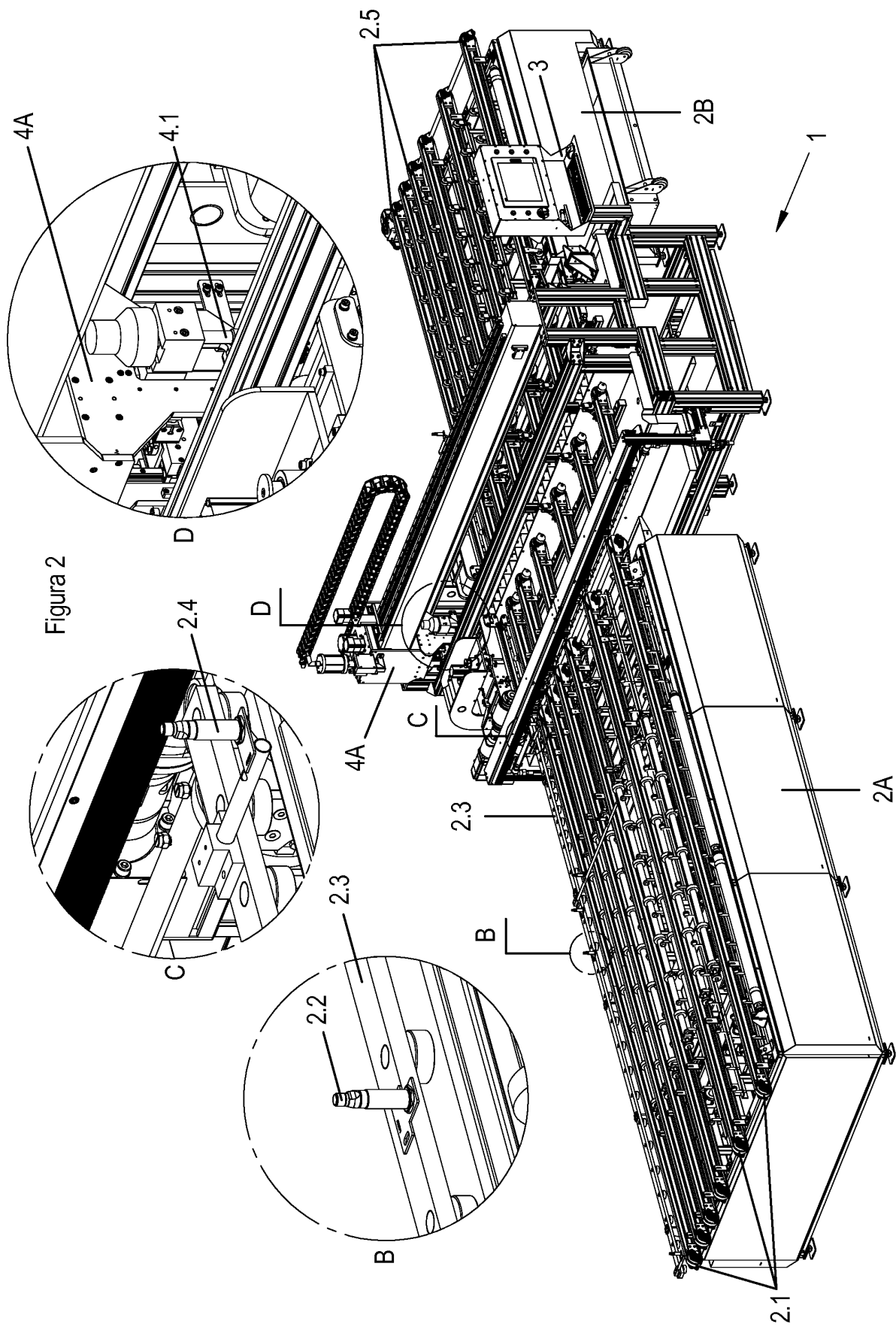
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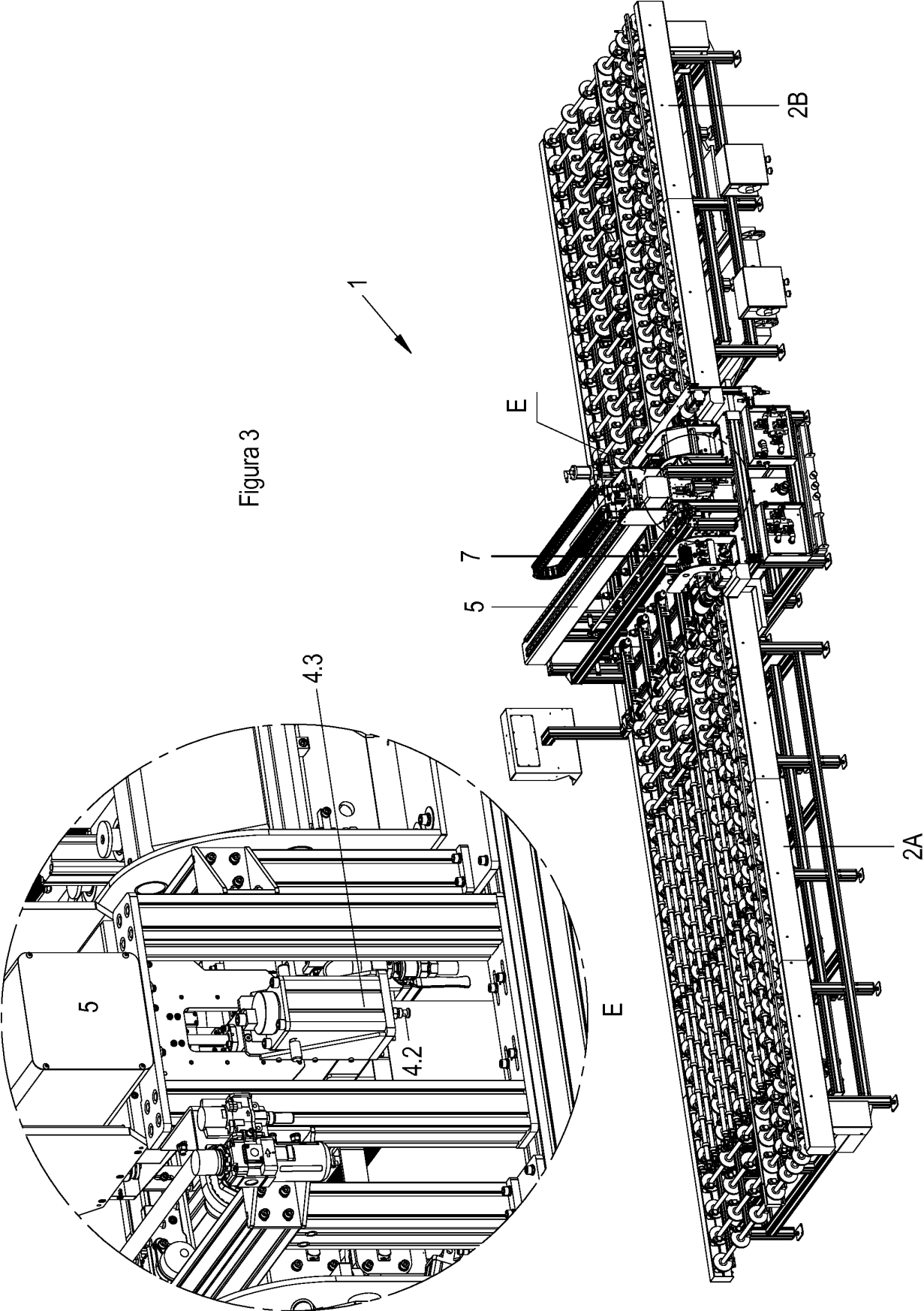
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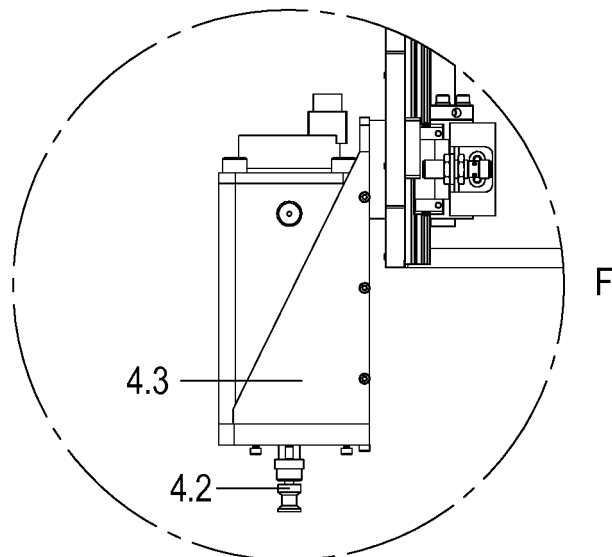
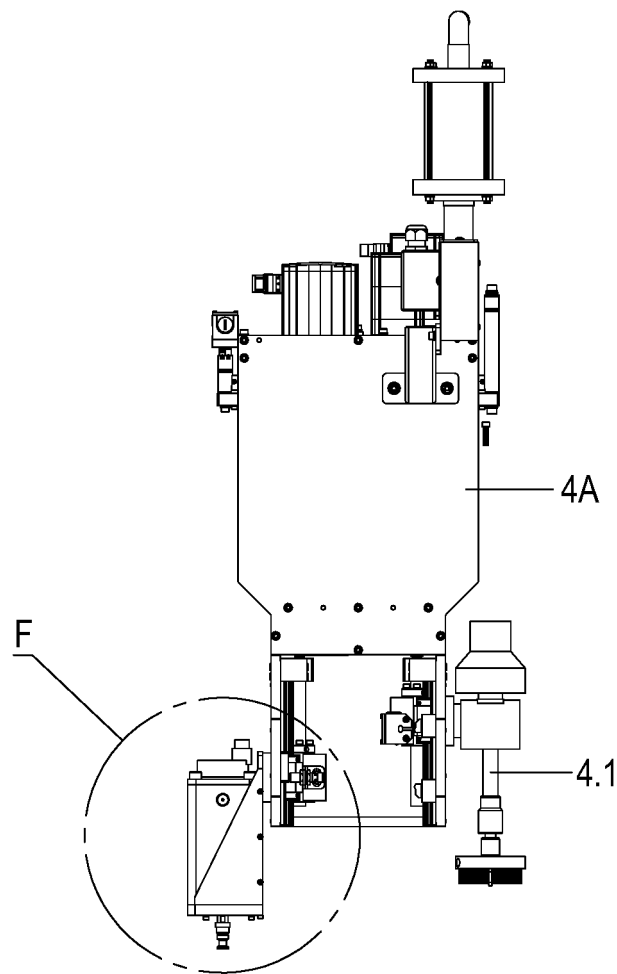
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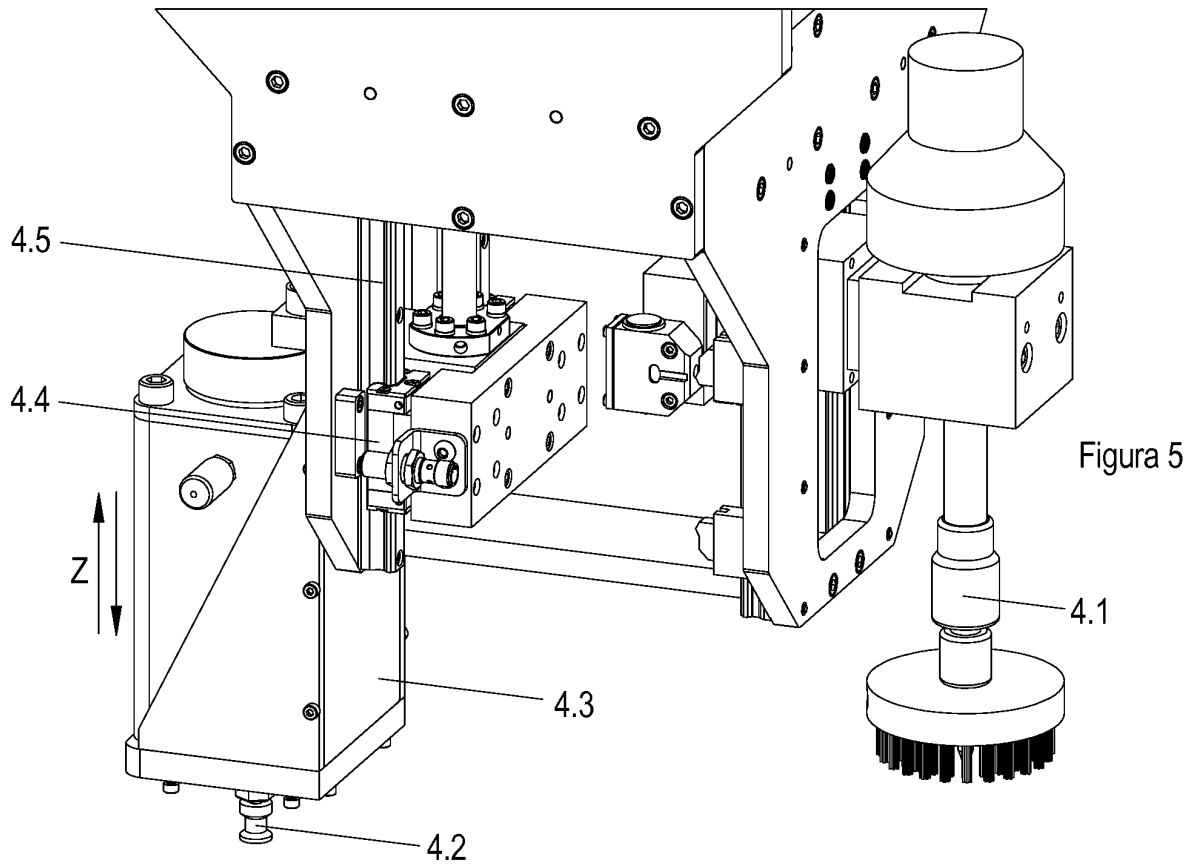
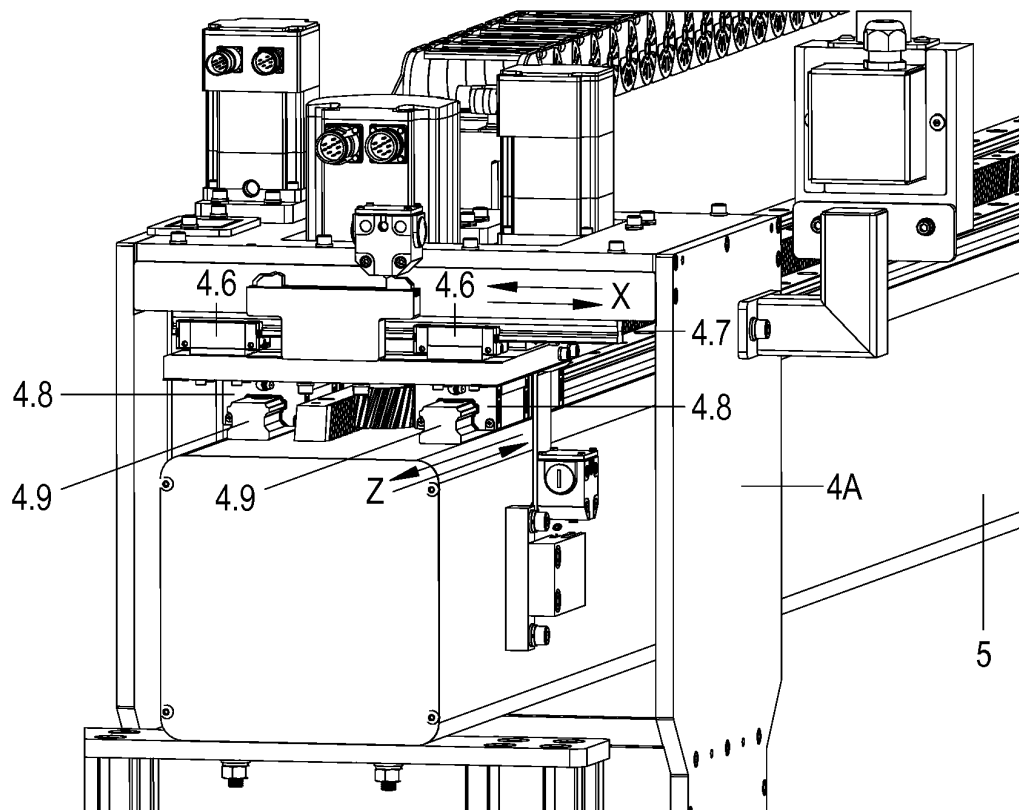


Figura 6



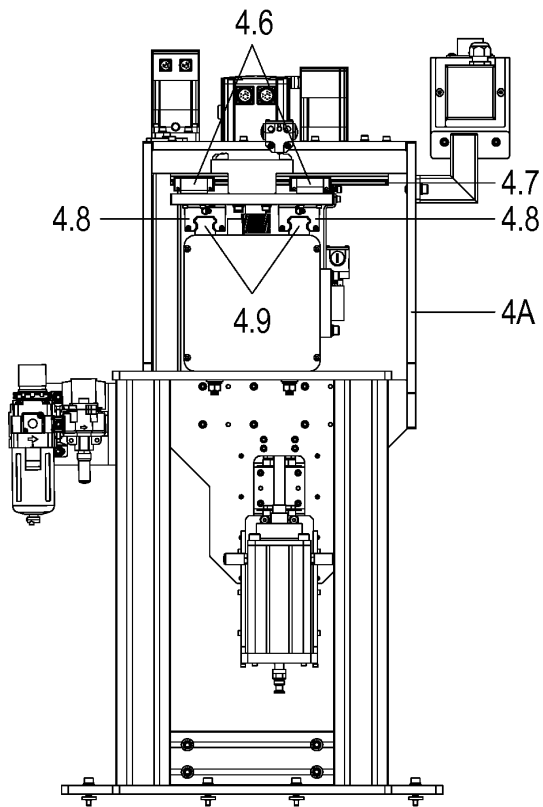


Figura 7

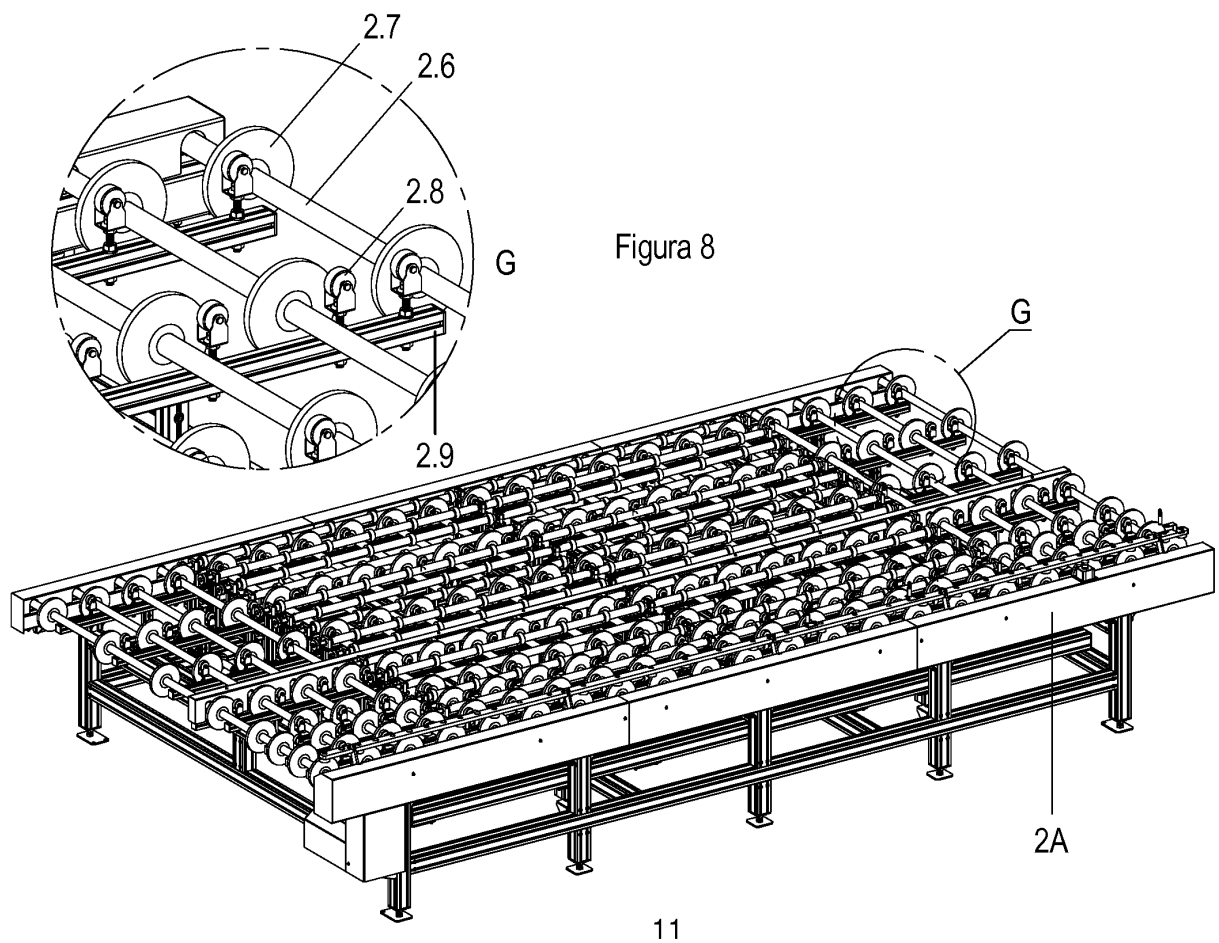


Figura 9

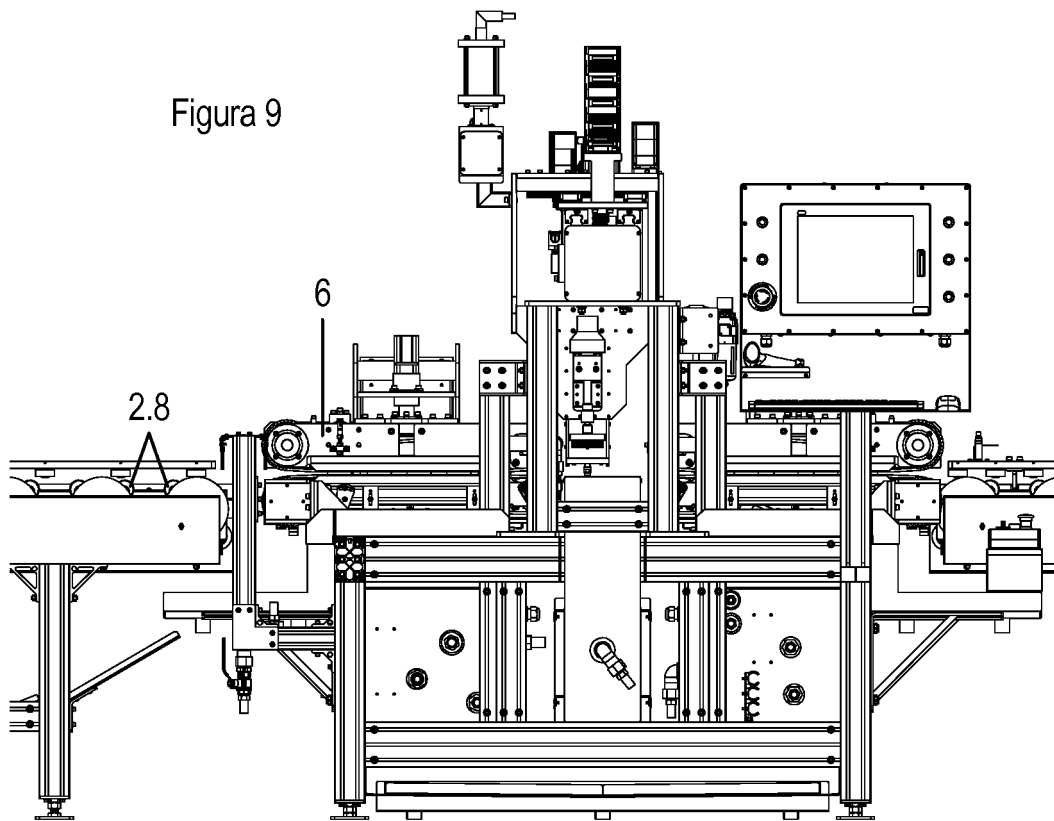


Figura 10

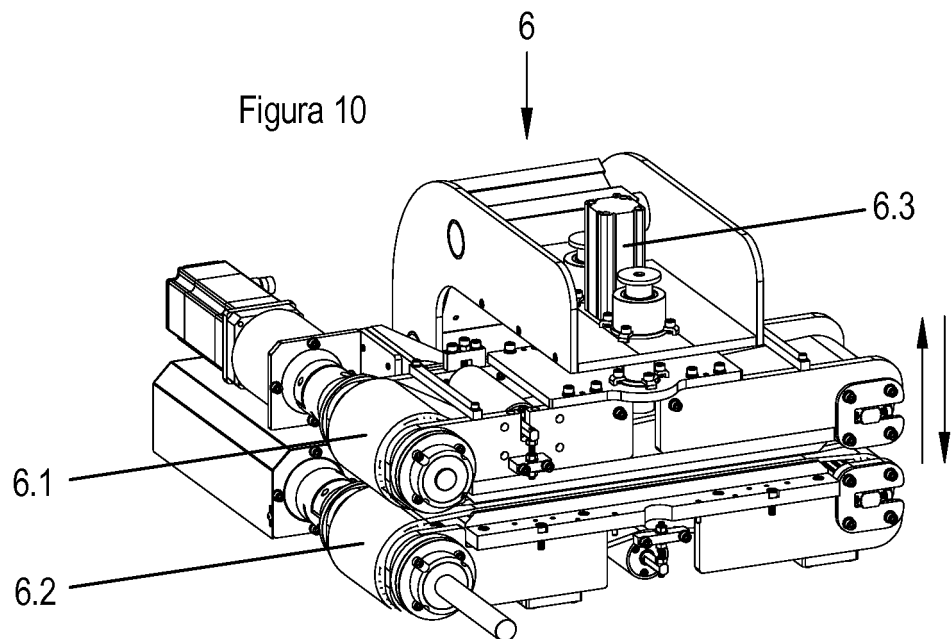


Figura 11

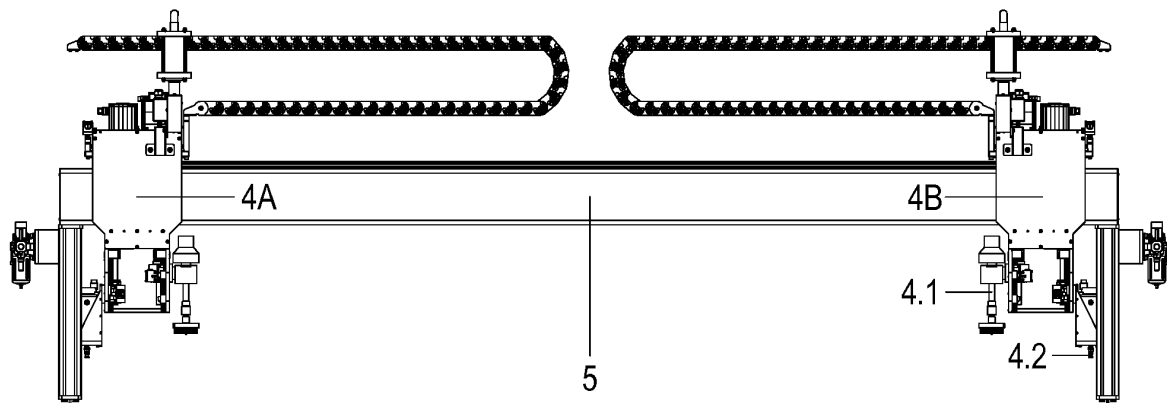


Figura 12

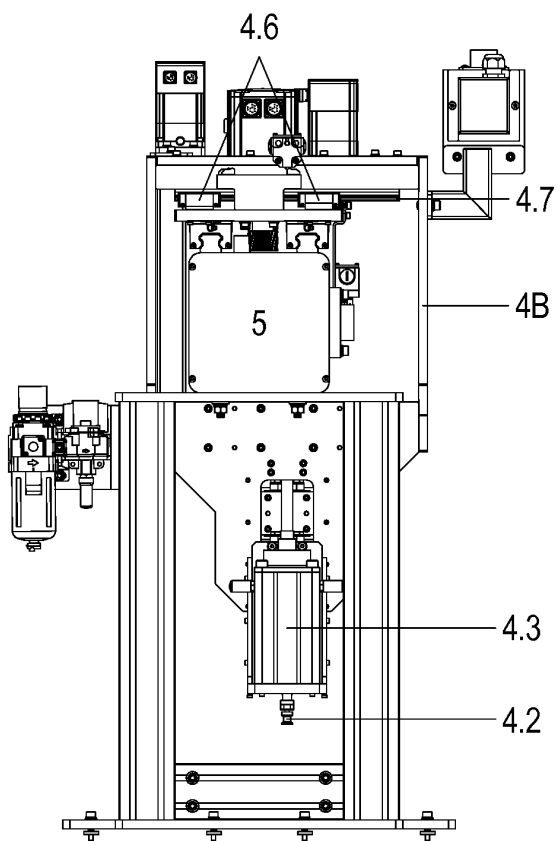
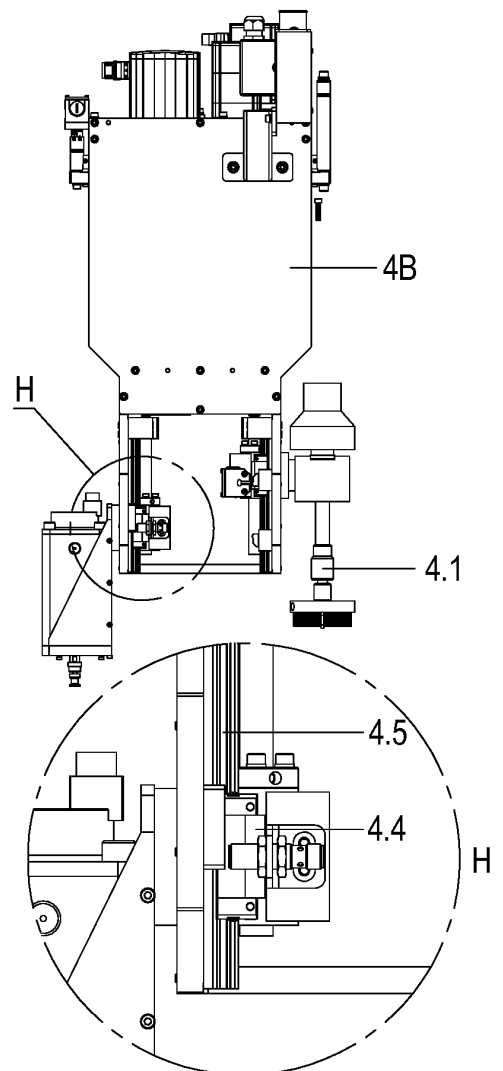


Figura 13



INTERNATIONAL SEARCH REPORT

International application No.

PCT/BR2016/000074

A. CLASSIFICATION OF SUBJECT MATTER

B24C5/02 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B24C; C03B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Espacenet; Epodoc

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4703591 A (LIBBEY OWENS FORD CO [US]) 03 November 1987 (1987-11-03) FIG.1	1 and 2
Y	WO 2012165864 A2 (PARK JAE HOON [KR]) 06 December 2012 (2012-12-06) FIGS. 1-3	1 and 2

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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"E" earlier application or patent but published on or after the international filing date

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

06 March 2017

Date of mailing of the international search report

07 March 2017

Name and mailing address of the ISA/

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US 4703591 A	1987-11-03	None	
WO 2012165864 A2	2012-12-06	WO 2012165864 A3 KR 20120134541 A KR 101309771 B1	2013-03-28 2012-12-12 2013-09-23

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 4703591 A [0003]