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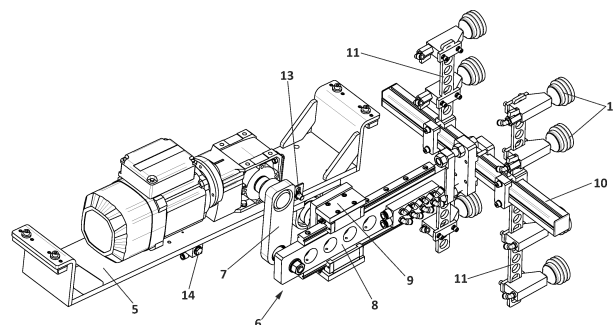
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(54) **MECHANISM FOR FEEDING SHEETS OF CARDBOARD INTO A BOX FORMING MACHINE**

(57) The invention relates to a mechanism for supplying cardboard sheets of a box-making machine that comprises a plurality of suction cups (12), wherein the mechanism comprises a pick-up arm (6) formed by a first segment (7) and a second segment (8), the second segment (8) being joined with sliding ability to a fastening element (9) that is joined to a fixed base (5) with the ability to freely rotate, wherein the first segment (7) and the

second segment (8) are joined in an articulated fashion, the other end of the first segment (7) is joined to the shaft of the geared motor, and the other end of the second segment (8) is joined to a support element that incorporates the suction cups (12), such that the rotation of the geared motor implies the collection of a cardboard sheet (4) in the stacking area (1) to be placed on the conveyor line (2).



**FIG. 3**

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## Description

### OBJECT OF THE INVENTION

[0001] The present invention relates to a box-making machine that incorporates a mechanism in charge of sucking the cardboard sheets from a reception area, where they are stacked to place them on a conveyor line to be taken to the shaping area where they are made into boxes. The mechanism is configured to reduce the amount of space needed to a minimum and enable the machine to optimise the manufacturing speed of the boxes based on the size thereof. Thus, it is activated by a geared motor, which is located next to the geared motor in charge of activating the male shaper, such that the mechanism can place the sheets on the conveyor line at the same level as the shaping area.

[0002] The invention is especially applicable to the industry of mechanisms for the manufacturing of folded cardboard boxes.

### TECHNICAL PROBLEM TO BE RESOLVED AND BACKGROUND OF THE INVENTION

[0003] Currently known in the state of the art are several different box-making machines in which a common feature is based on the preparation of boxes before they arrive to the shaping area from a reception area in which the boxes are stacked in the form of folded sheets.

[0004] Document ES-2660059\_B1 represents a box-making machine formed mainly by a reception area that incorporates a stacking area wherein the folded boxes are placed in the form of sheets and in which the boxes are collected, and a shaping area, defined by a pressing station that is delimited by longitudinal rails for guiding the box to be shaped, wherein the box is given its definitive shape. A shaping device is in charge of moving the box from the reception area to the shaping area, and by means of a conveyor device, it collects a box by moving a pick-up arm that incorporates a system of suction cups in the direction of the reception area, along a front axis, to then moves in the direction of the shaping area, along a transverse axis, and delivers the box to the pressing station, where the box will then be finally shaped.

[0005] In this machine, the shaping device incorporates a curved bar that causes the box to unfold in its turning movement along to the front axis, the box being sucked by the suction cup system but in an open-box position. The box-making machine also incorporates two transverse folders, in charge of folding the transverse flaps of the base of the box and a pair of longitudinal folders, both separated the same distance from the width of the box to be shaped and configured in the form of inclined sheets that interfere with the longitudinal flaps of the box to fold them as the box advances.

[0006] This way, the shaping device positions the box, held by the suction cup system and with the four bottom flaps already folded, in the shaping area to finish shaping

the box into its definitive shape.

[0007] However, this invention has a drawback in that it includes too many mechanisms for moving the box from the reception area to the shaping area, requiring large dimensions for the machine.

[0008] Document ES-1127280\_U describes a box-making machine that incorporates a cardboard sheet collection mechanism to take the sheets from the supply area to the conveyor line. To do so, the mechanism is formed by two arms with suction cups joined by a shaft that is activated by a geared motor to be able to collapse and move from a vertical position in which the sheets are collected, to horizontal position in which they are placed on a conveyor line. The mechanism is located in the lower area of the machine, placed within the conveyor line, such that it does not occupy additional space.

[0009] However, this mechanism cannot be used in any machine, especially if the machine is not specifically designed for it.

[0010] The present invention describes a box-making machine that incorporates a sheet supply mechanism that solves the previously mentioned problems. To do so, it incorporates a pick-up arm, which comprises a system of suction cups with the ability to rotate to suck the boxes, such that the sheets are collected in a vertical position in accordance with how they are located in the stacking area of the reception area, to be placed on a conveyor line, by which they are taken to the shaping area, thereby reducing the dimensions of the machine without affecting the functionality thereof. The mechanism is actuated by a geared motor located at the same level as the geared motor that activates the male shaper, in the upper area, so that it does not interfere with other elements of the machine.

### DESCRIPTION OF THE INVENTION

[0011] With the aim of achieving the objectives and avoiding the previously mentioned drawbacks, the present invention describes a mechanism for supplying cardboard sheets of a box-making machine that is activated by a geared motor located on a fixed base, in addition to a cardboard sheet stacking area, a shaping area and a conveyor line intended to convey the collected sheets to the shaping area. To do so, the mechanism comprises a plurality of suction cups connected to a pneumatic system configured to create a depression when activated and thereby be able to suck the sheets.

[0012] It is important to consider that the mechanism is located in the proximity of the shaping area with the aim of having the lower edge of the sheets, according to the placement thereof in the stacking area, always next to the end of the conveyor line, where the glue guns are located, just before heading to the shaping area, being free at the other end to receive cardboard sheets with greater dimensions. This way, the cycle time is reduced to the minimum, thereby increasing the productivity of the machine.

**[0013]** The mechanism is configured by means of a pick-up arm formed by a first segment and a second segment joined in an articulated fashion by one of the ends thereof.

**[0014]** The first segment is solidly joined at the other end to the shaft of the geared motor.

**[0015]** The second segment is solidly joined at the other end to a support element to which a plurality of suction cups is fastened.

**[0016]** Furthermore, the second segment is joined, with sliding ability, to a fastening element which, in turn, is joined to the fixed base by a shaft with the ability to freely rotate. This way, movement of the geared motor causes a rotation of the first segment, which causes both the rotation as well as the sliding of the second segment with respect to the fixed base. With this configuration, the geared motor has rotational movement to make the second segment rotate at the same time that it initially slides with respect to the fastening element to withdraw from the conveyor line and, continuing to rotate, slide in the opposite direction to move towards the stacking area and collect a cardboard sheet by suction. Then, the geared motor changes the direction of the rotation so that the second segment does the opposite movement, sliding with respect to the fastening element to withdraw from the stacking area, with the sheet collected, and then slide in the opposite direction to place it on the conveyor line, where the cycle ends. The positions of the mechanism where the geared motor changes the direction of rotation are determined by detectors.

**[0017]** To provide the system with possibilities for adjustment, the support element of the mechanism can be a support shaft in which a pair of longitudinal members on each one of the ends, to which the plurality of suction cups is fastened.

**[0018]** Furthermore, the location of the suction cups on the longitudinal members as well as the longitudinal members on the support shaft is adjustable, such that the dimension of the cardboard sheets is not a limitation for the mechanism of the invention.

#### BRIEF DESCRIPTION OF THE FIGURES

**[0019]** To complete the description of the invention, and for the purpose of helping to make the features thereof more readily understandable, according to a preferred exemplary embodiment thereof, a set of drawings is included wherein, by way of illustration and not limitation, the following figures have been represented:

- Figure 1 represents a side view of the inside of a box-making machine incorporating the mechanism of the invention on the conveyor line, the cardboard sheet stacking area and the box-shaping area.
- Figure 2a represents a perspective view of the mechanism of the invention in a position of collecting a cardboard sheet.
- Figure 2b represents a perspective view of the mechanism of the invention with a sheet collected in the

rotation process to be placed on the conveyor line.

- Figure 2c represents a perspective view of the mechanism of the invention in a position of releasing a sheet on the conveyor line.
- Figure 3 represents an isolated perspective view of the mechanism of the invention to more clearly show the components thereof.

**[0020]** A list of the references used in the figures is provided below:

1. Stacking area.
2. Conveyor line.
3. Shaping area.
4. Cardboard sheet.
5. Fixed base.
6. Pick-up arm.
7. First segment.
8. Second segment.
9. Fastening element.
10. Support shaft.
11. Longitudinal members.
12. Suction cups.
13. First detector.
14. Second detector.

#### DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

**[0021]** The present invention relates to a mechanism for supplying cardboard sheets (4) that is incorporated in a box-making machine by means of which the cardboard sheets (4) are collected in a stacking area (1) to be placed on a conveyor line (2) that takes them to the shaping area (3).

**[0022]** Figure 1 represents a side view of the mechanism of the invention located in the box-making machine. In this figure it may be seen how the space between the stacking area (1) and the shaping area (3) is reduced to the minimum to provide a conveyor line (2) with a linear dimension that can be as small as the dimension of the cardboard sheets of the box to be shaped. This way, the machine is dimensioned to be able to receive cardboard sheets (4) with a specific maximum size. In the case of shaping boxes with cardboard sheets (4) of smaller dimensions, the bottom side of the sheet (4), according to how it is placed in the stacking area (1), is always positioned in the gluing area, located at the entrance of the shaping area (3), the free space being in proximity to the stacking area (1). This way, the production speed is always the same, regardless of the size of the cardboard sheet (4), and the path of the conveyor belt (2) is optimised with respect to the length of the cardboard sheet (4).

**[0023]** Figure 2a represents the phase of collecting the cardboard sheet (4) from the stacking area (1) by the pick-up arm (6) of the mechanism.

[0024] Figure 2c represents the phase of placing the cardboard sheet (4) on the conveyor line (2).

[0025] Figure 3 represents the mechanism of the invention in an isolated fashion to show the components thereof in greater detail.

[0026] As represented in figure 3, the mechanism is located on a fixed base (5) that supports the geared motor. The mechanism is located in proximity to the shaping area (3), such that the sheets (4) can always be placed in proximity to the same, leaving a free space for production using sheets (4) of greater dimensions in proximity to the stacking area (1).

[0027] The mechanism is configured by a pick-up arm (6) that comprises a first segment (7) and a second segment (8) joined in an articulated fashion by one of the ends thereof.

[0028] The first segment (7) is solidly joined by the free end to the shaft of the geared motor.

[0029] The second segment (8) is joined by an intermediate area to a C-shaped fastening element (9), having the ability to slide on the same. The fastening element (9) is joined to the fixed base (5) by means of a shaft with the ability to rotate freely.

[0030] A support shaft (10) is solidly joined to the free end of the second segment (8) by a central area, making up arms, to each one of which a longitudinal member (11) is fastened. At least one suction cup (12) is fastened to each one of the longitudinal members (11). The position of the suction cups (12) on the longitudinal members (11) and the longitudinal member (11) on the support shaft (10) can be adjusted according to the user's specific needs, as well as the number of suction cups (12) and the dimensions of both the longitudinal members (11) and the support shaft (10), such that there is no limitation when collecting a cardboard sheet (4) due to the size thereof, the only limitation being the size of the machine.

[0031] With this configuration of the pick-up arm (6), given that the mechanism in the initial resting position is in the position of having just placed a sheet (4) on the conveyor line (2), an anticlockwise rotational movement, as shown in figure 3, of the geared motor causes the first segment (7) to rotate in the same direction, which implies a rotation and a sliding with respect to the fastening element (9) of the second segment (8) to withdraw from the conveyor line (2). As the rotation of the first segment (7) continues, the second segment (8) also continues rotating in order to change the sliding direction and move towards the stacking area to collect a cardboard sheet by suction. At that moment, the first detector (13) detects that the second segment (8) has reached its limit position and causes the geared motor to change the direction of rotation so that the second segment (8) carries out the opposite movement, sliding with respect to the fastening element (9) to remove itself from the stacking area (1), with the collected sheet (4), and then sliding in the opposite direction to place it on the conveyor line (2), where the second detector (14) detects the position of the second segment (8) and causes a change in the direction of

rotation of the geared motor to begin a new cycle.

[0032] Once the cardboard sheet (4) has been placed on the conveyor belt (2), it is conveyed to the shaping area (3), where the box-shaping process continues while the mechanism begins a new cycle to collect the next sheet (4).

[0033] Lastly, it must be taken into account that the present invention must not be limited by the embodiment described herein. Other configurations may be carried out by those skilled in the art based on the present description. Accordingly, the scope of the invention is defined by the following claims.

## 15 Claims

1. A mechanism for supplying cardboard sheets of a box-making machine that comprises a geared motor located on a fixed base (5) in addition to a stacking area (1) for cardboard sheets (4), a shaping area (3) and a conveyor line (2) intended to convey the cardboard sheets (4) collected in the stacking area (1) to the shaping area (3), wherein the mechanism comprises a plurality of suction cups (12) connected to a pneumatic system configured to create a depression when activated, wherein the mechanism comprises a pick-up arm (6) formed by a first segment (7) and a second segment (8), the second segment (8) being joined with sliding ability to a fastening element (9) that is joined to the fixed base (5) with the ability to rotate freely, the mechanism being **characterised in that:**

- the first segment (7) and the second segment (8) are joined in an articulated fashion by some of the ends thereof,
- the other end of the first segment (7) is solidly joined to the shaft of the geared motor;
- the other end of the second segment (8) is solidly joined to a support element that incorporates the plurality of suction cups (12);

such that the rotation of the geared motor implies the collection of a cardboard sheet (4) in the stacking area (1) to be placed on the conveyor line (2).

2. The mechanism for supplying cardboard sheets of a box-making machine, according to claim 1, **characterised in that** the support element is a support shaft (10) fastened to the second segment (8) by an intermediate area that incorporates longitudinal members (11) on the ends thereof, on which the suction cups (12) are located.

3. The mechanism for supplying cardboard sheets of a box-making machine, according to claim 1, **characterised in that** the location of the mechanism is such that the sheets (4) are placed in an area of the

conveyor line next to the shaping area.

4. The mechanism for supplying cardboard sheets of a box-making machine, according to claim 2, **characterised in that** the location of the suction cups (12) on the longitudinal members (11) is adjustable. 5
5. The mechanism for supplying cardboard sheets of a box-making machine, according to claim 2, **characterised in that** the location of the longitudinal members (11) on the support shaft (10) is adjustable. 10
6. The mechanism for supplying cardboard sheets of a box-making machine, according to claim 2, **characterised in that** it comprises a first detector (13) that detects the final movement of the second segment (8) once it has collected a sheet (4) from the stacking area (1) to cause a change in the direction of rotation of the geared motor. 15  
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7. The mechanism for supplying cardboard sheets of a box-making machine, according to claim 2, **characterised in that** it comprises a second detector (14) that detects the final movement of the second segment (8) once it has placed the sheet (4) on the conveyor line to cause a change in the direction of rotation of the geared motor. 25  
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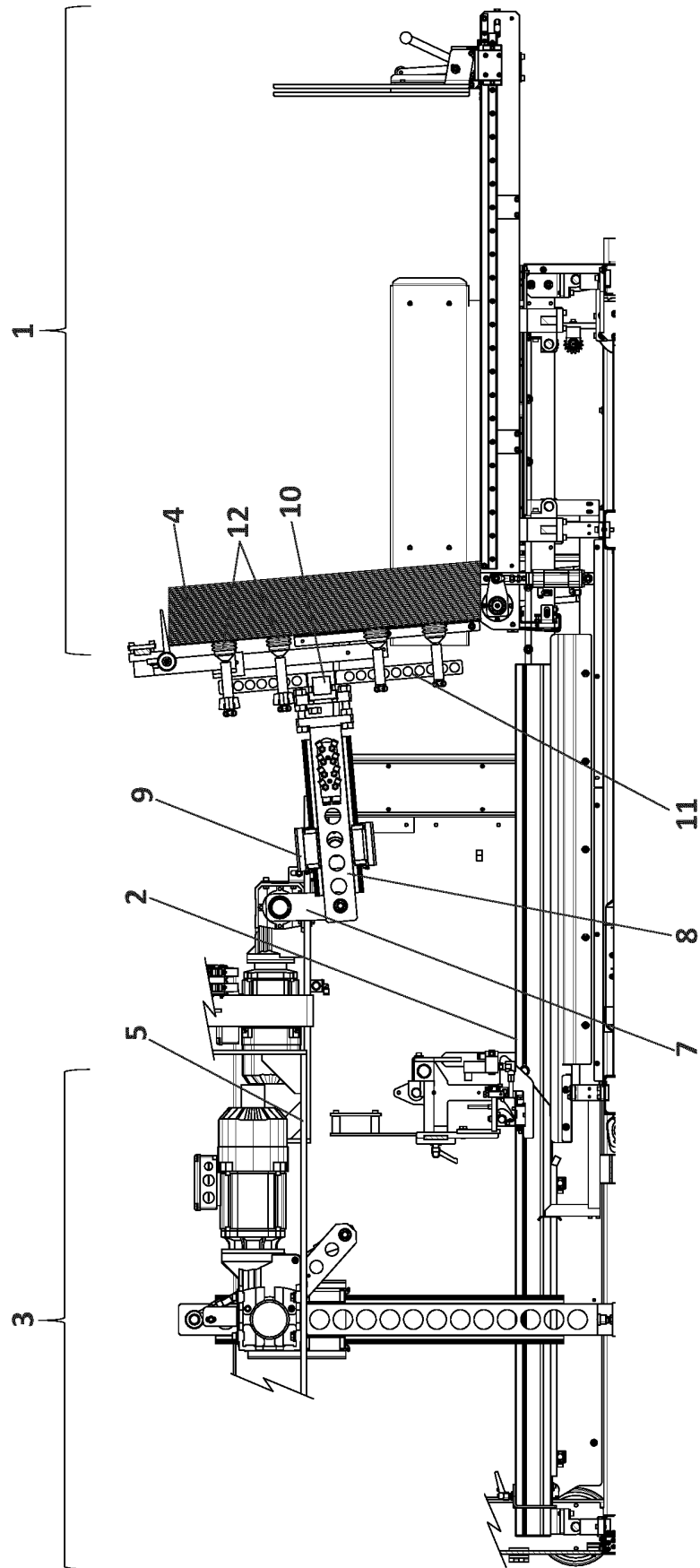


FIG. 1

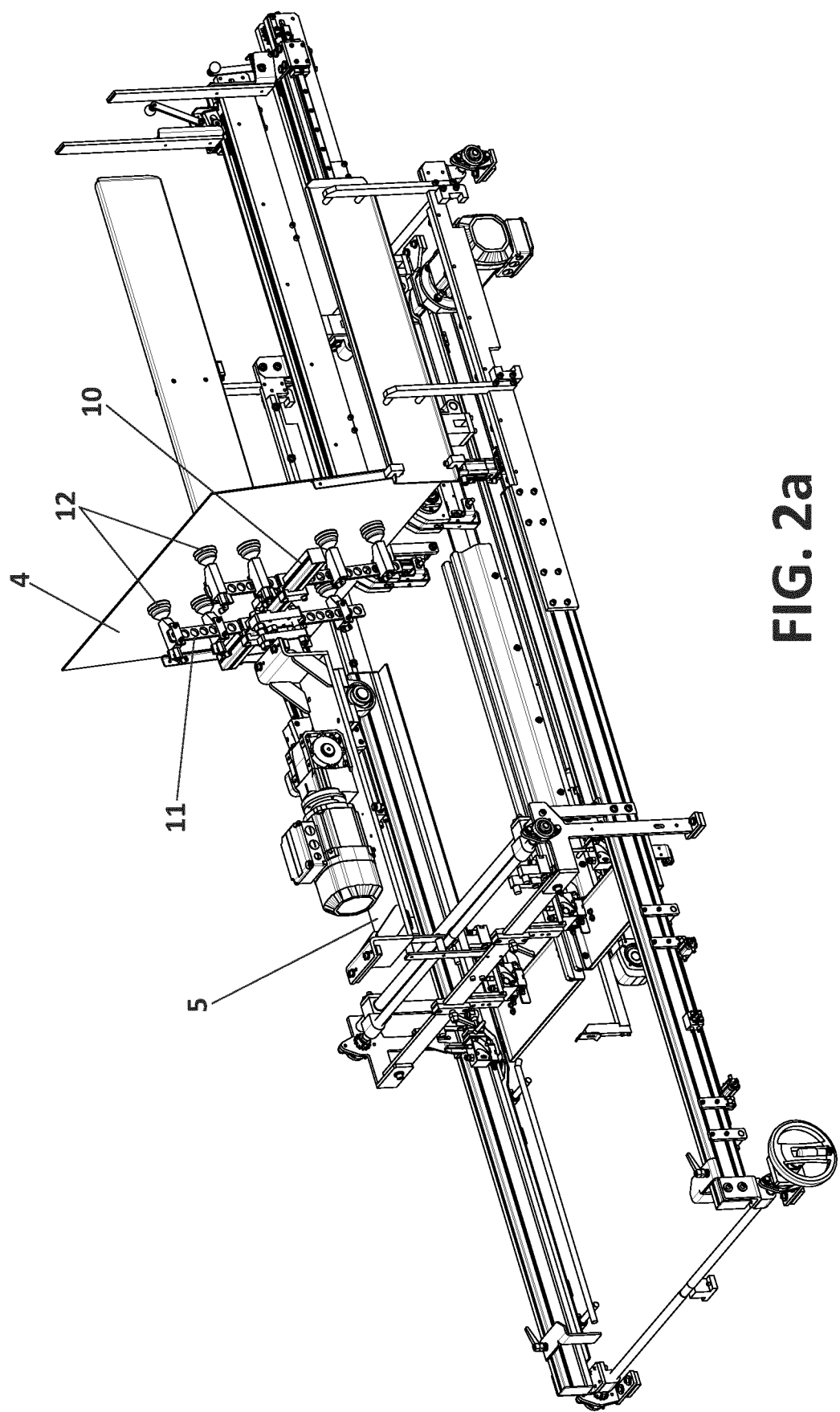


FIG. 2a

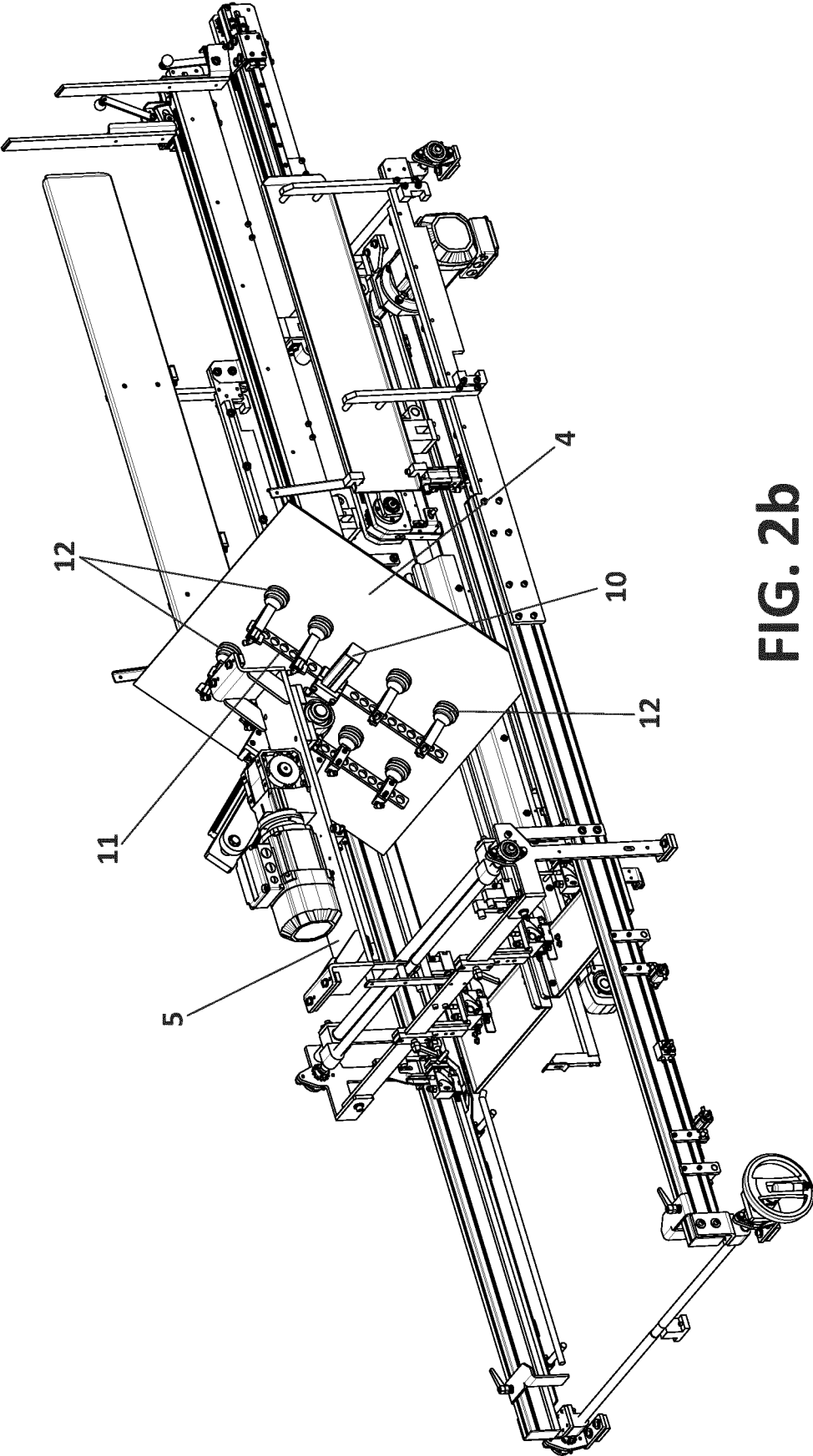


FIG. 2b



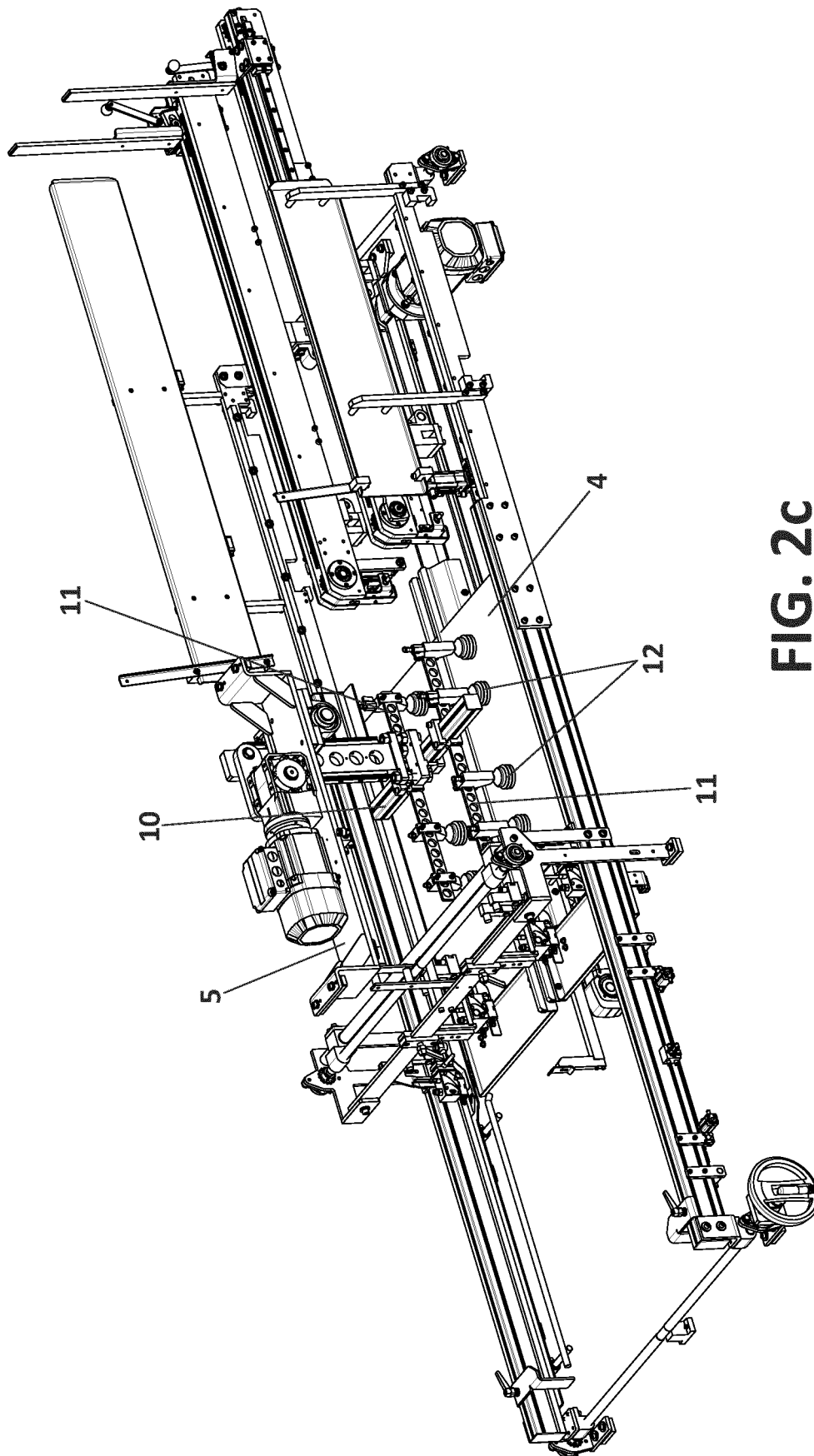


FIG. 2c

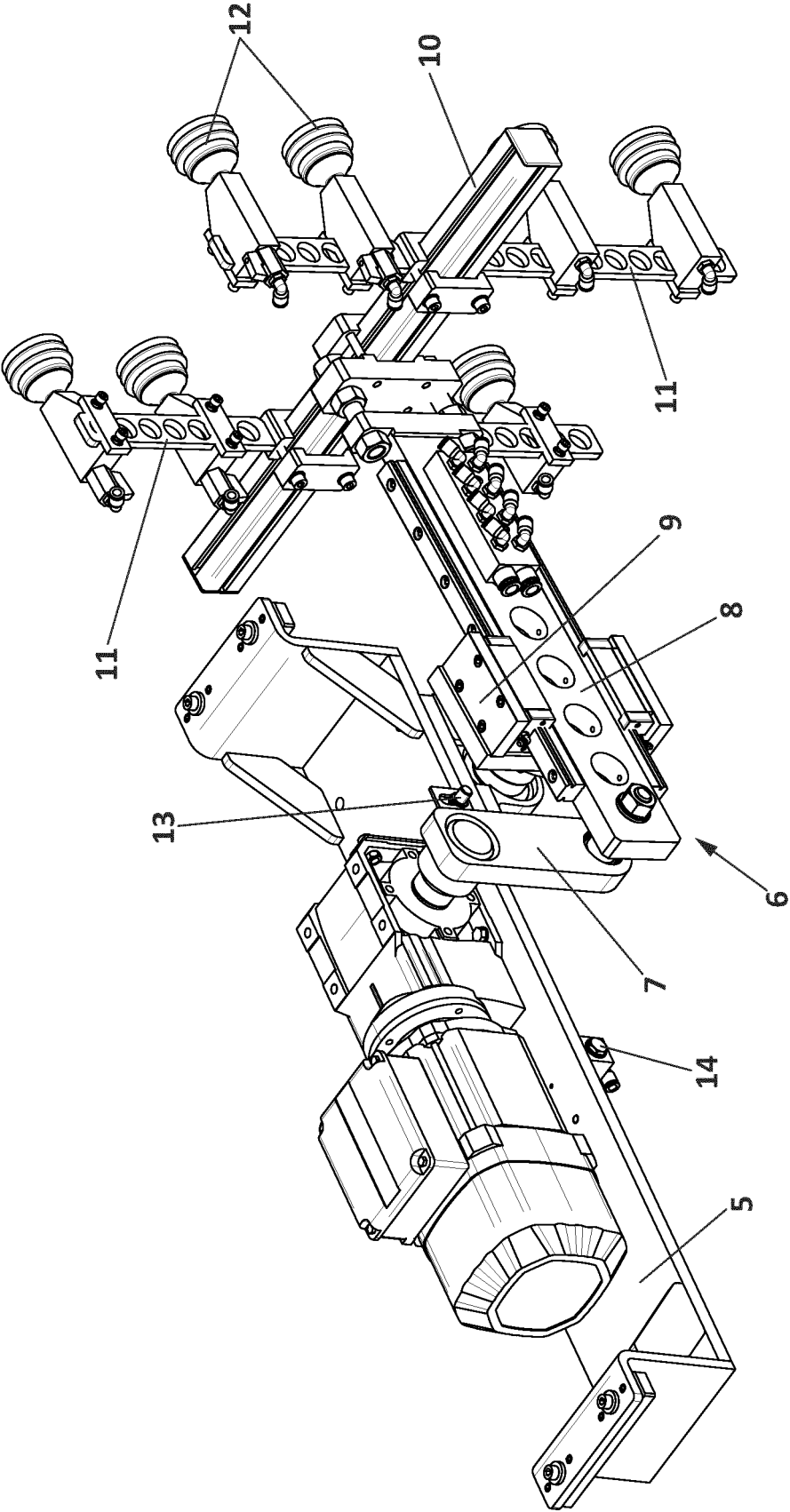


FIG. 3

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/ES2021/070055

## A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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)

B31B, B65B, F16H

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)

EPODOC, INVENES, WPI

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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

* Special categories of cited documents:	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"A" document defining the general state of the art which is not considered to be of particular relevance.	"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 documents, such combination being obvious to a person skilled in the art
"E" earlier document but published on or after the international filing date	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

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Form PCT/ISA/210 (patent family annex) (January 2015)

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*B65B35/18* (2006.01)

*F16H21/14* (2006.01)

*F16H21/22* (2006.01)

*F16H21/30* (2006.01)

**REFERENCES CITED IN THE DESCRIPTION**

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