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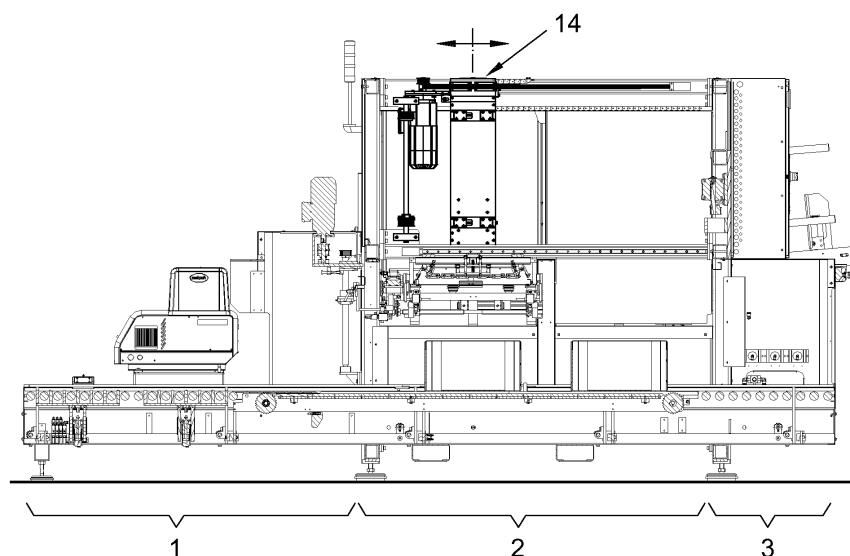
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(54) **MACHINE FOR PUTTING LIDS ON BOXES**

(57) Disclosed is a machine for putting lids on boxes, which comprises: a supply area (1) with a conveyor track (4); at least one mechanism (6) with elevators; brakes (24); and a station (5) for reading dimensions. The machine also comprises a working area comprising: at least one gluing device; at least one device (14) for putting on lids which incorporates a vertical actuation mechanism

(15) connected to a cross-shaped end (16), with a folding device (17) and an actuator (21) on each of the arms, and two tracks (23) on respective opposing arms; and a lid-positioning device (13) for moving a lid (9) and positioning same on the tracks (23). Lastly, the machine comprises an exit area (3) that incorporates another conveyor track (4).



**FIG. 1**

## Description

### OBJECT OF THE INVENTION

[0001] The present invention relates to a machine for quickly and effectively putting lids on conventional cardboard boxes by placing a flat lid equipped with perimeter flaps that are folded around the opening of the box and pressed so that they are fixed through the actuation of an applied glue.

[0002] It is especially applicable in the field of industry related to parcel shipments and logistics in general.

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

[0003] Machines related to the manufacturing of cardboard boxes are already known in the current state of the art. The boxes that are manufactured come from sheets of cardboard that are die cut with the certain measurements for the formation of the box in particular. These boxes can be open or with flaps in order to be closed later.

[0004] The closing process of the machines is also known in the state of the art, being generally used in the industry and, mainly, by companies dedicated to supplying parcels. Once the boxes have been filled, the closing process must be performed. In these cases, a distinction is made between the boxes with flaps and open boxes without flaps.

[0005] In the case of boxes with flaps, the machines focus on an initial flap-folding phase.

[0006] The boxes without flaps also comprise an initial phase in which they must be closed by means of an independent lid. The lids used can be of two types: those that incorporate a perimeter flange, such that they fit in the open perimeter edge of the box intended to be closed and others that are simply a flat sheet that is placed on the box.

[0007] In both cases, be for boxes with flaps or for boxes without them, the closure must comprise an additional phase consisting on fastening the lid to the box. To do so, the application of sealing tape or strapping bands is used, such that the closing is definitive and must be broken in order to open the box.

[0008] However, these methods of closing boxes have the disadvantage that they have additional elements, such as the sealing tape or strapping band, which can get caught during handling and open, triggering the emptying of the box and the resulting subsequent logistic problem.

[0009] The present invention solves this problem by presenting a machine for putting lids on boxes that incorporates a lid with perimeter flaps that are folded and subsequently joined to the box by means of glue. Thus, the inviolability of the contents is ensured, since any tampering must break the lid without any possibility of repair.

## DESCRIPTION OF THE INVENTION

[0010] The present invention relates to a machine for putting lids on boxes by means of the implementation of a flat lid with flaps that are folded in order to be joined to the box by means of glue.

[0011] The machine comprises a supply area, a working area and an exit area.

[0012] The supply area incorporates a conveyor track, at least one mechanism with elevators that acts on a box during a certain time, such that the box is elevated and immobilized, pausing the supply of boxes. In addition to the elevators, the supply area incorporates brakes that, with the box in an elevated position, hold it such that the immobilization thereof is ensured, either by giving it stability or by preventing it from being pushed by a box that comes from behind. It also incorporates a station for reading dimensions for capturing the dimensions of the box.

[0013] The working area incorporates at least one gluing device configured to apply glue on a box, a lid or both. It also incorporates at least one device for putting on lids. The device for putting on lids comprises a vertical actuation mechanism connected to a cross-shaped end that incorporates two tracks located in parallel in order to house the lid. The cross-shaped end also incorporates, on each of the arms, a folding device that is used, once the vertical actuation mechanism is unfolded, for folding the flaps of the lid and maintaining the pressure during a predetermined time. Each of the folding devices incorporates an actuator and can be positioned along the respective arms of the cross-shaped end, such that they are valid for different lid sizes. The rotating movement of each folding device is activated upon exerting pressure on the actuators. Finally, it also incorporates a lid-positioning device configured for moving a lid and positioning it on the tracks of the device for putting on lids.

[0014] The exit area also incorporates a conveyor track for extracting the boxes from the machine.

[0015] The machine can incorporate a mechanical arm with at least one vacuum suction cup and a lid feeder. The mechanical arm can be moved in order to extract lids from the feeder by means of the vacuum suction cups.

[0016] The device for putting on lids of the machine can also comprise a thrust plate fastened to the cross-shaped end by means of at least one retractable shaft. Upon unfolding the vertical actuation mechanism, the lid is positioned on the box. As it continues to unfold, the lid leaves the tracks until the thrust plate touches the lid and exerts pressure on a large surface of the lid, helping to adjust the position of the lid on the box. As the thrust plate makes contact with a lid and presses on it, the retractable shafts are contracted, such that the thrust plate is retracted and exerts pressure on the actuators, which cause the rotating movement of the folding devices.

[0017] The machine may comprise two devices for putting on lids configured to act simultaneously on two lids. On this occasion, when one of the devices for putting

on lids is unfolded in order to exert pressure on a lid, instead of remaining static so that a pusher subsequently drags the box, it is the very device for putting on lids that drags the box, so that time is used to the fullest extent possible. In order to find a machine that is as compact as possible, the devices for putting on lids are located in positions facing each other with respect to the longitudinal shaft of the conveyor track and they are configured to be moved along respective tracks parallel to the conveyor track such that they do not interfere with each other. Thus, while one of the devices for putting on lids moves in one direction with the vertical actuation mechanism in the unfolded position, exerting pressure on the lid of a box, the other device for putting on lids moves in the folded position in the return direction.

**[0018]** The activation of the different components of the machine can be carried out by means of electro-mechanical means. Thus, it controls the cadence of the boxes in the supply area, the activation and stopping of the pushers, the activation of the mechanical arm and the suction cups for extracting a lid, the activation of the lid-positioning device for placing the lid on the tracks of the device for putting on lids and the activation of the device for putting on lids.

**[0019]** The machine can also incorporate electronic means for controlling the process, such as a microprocessor configured, in addition to activating the different components of the machine, to receive the data obtained in the station for reading dimensions making it accessible to the gluing devices and to the device for putting on lids, so that they obtain data on the height of the box, the position of the lid and the dimensions of the lid. In this case, the different components are electrically connected with the microprocessor, physically or by wireless means. Thus, based on the data received by the microprocessor in the station for reading dimensions, the gluing devices apply the beads of glue in the predetermined position, and the devices for putting on lids have information on the height at which they are to be positioned so that the thrust plates may exert pressure on the lids.

## DESCRIPTION OF THE FIGURES

**[0020]** To complement the invention that is being described and for the purpose of aiding to better understand the characteristics of the invention according to a preferred embodiment thereof, a set of drawings is attached wherein, for purposes of illustration and not limitation, the following figures have been represented:

- Figure 1 represents a lateral view of the machine of the invention in a first embodiment.
- Figure 2 represents a lateral view of the machine of the invention in a second embodiment.
- Figure 3 represents a lateral view of the supply area of the machine.
- Figure 4 represents the lid-feeding area.
- Figure 5 represents a lid-positioning device.

- Figure 6 represents a device for putting on lids.
- Figure 7 represents a cross-sectional view of the device for putting on lids wherein the folding devices are represented in detail.
- Figure 8 represents a plan view of the machine of the invention in the second embodiment.
- Figure 9 represents a device for putting on lids in the second embodiment before folding the flaps of a lid on a box.
- Figure 10 represents a device for putting on lids in the second embodiment exerting pressure on the flaps of a lid on a box.

**[0021]** A list is of the references used in the figures is provided below:

1. Supply area.
2. Working area.
3. Exit area.
4. Conveyor track.
5. Station for reading dimensions.
6. Elevators.
7. Movable rollers.
8. Pushers.
9. Lids.
10. Box.
11. Vacuum suction cups.
12. Lid-positioning device.
13. Lid pusher.
14. Device for putting on lids.
15. Vertical actuation mechanism.
16. Cross-shaped end.
17. Folding devices.
18. Lid feeder.
19. Mechanical arm.
20. Thrust plate.
21. Actuator.
22. Retractable shaft.
23. Tracks.
24. Brake.

## DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

**[0022]** The present invention relates to a machine for putting lids on boxes (10) by implementing a flat lid (9) with flaps that are folded in order to join them to the box (10) by means of glue.

**[0023]** As seen in Figures 1 and 2, in two embodiments, the machine has a configuration consisting of a supply area (1), a working area (2) and an exit area (3). In order to describe the components of the machine, a box (10) will be monitored in the complete path thereof through the machine.

**[0024]** As represented in Figure 3, initially, the boxes (10) are provided in a supply area (1), located at one end of the machine. The supply area (1) incorporates a conveyor track (4) and a station (5) for reading dimensions.

**[0025]** The conveyor track (4) is preferably made up of a series of movable rollers (7) for transporting the boxes (10). It is divided into a first initial section through which the boxes (10) access the machine, or stop section, and a final section or movable section.

**[0026]** The stop section incorporates mechanisms that incorporate elevators (6) located beneath the level of the movable rollers (7) that, upon being activated, are elevated, rising above the movable rollers (7), elevating with them a box (10) that is found in that location. This effect causes the box (10) to stop being in contact with the rollers (7) and, therefore, stop being transported, causing a stop in the supply of boxes (10) to the movable section. This stop will be based on the time required in the processing in the working area (2) of the machine, such that the cadence is as required. The machine also incorporates brakes (24) that are activated at the same time as the elevators (6), such that when the box (10) is elevated, they hold it, leaving it immobilized, eliminating the low stability of the box (10) on the elevators (6) and preventing it from being pushed by another box (10).

**[0027]** By deactivating the elevator mechanisms (6), the brakes (24) are also deactivated and the box (10) comes back into contact with the movable rollers (7), and starts to move in order to continue through the movable section until reaching the station (5) for reading dimensions, located at the end of the supply area (1).

**[0028]** The box (10) is transported to a certain position in the station (5) for reading dimensions, in which there are no rollers (7) and they cannot continue dragging it, the box (10) being stopped. In this position the dimensions of the box (10) are read by means of a scanner, optical viewfinder, probes or any other similar means.

**[0029]** In the vicinity of the dimension station (5) there are pushers (8) the function of which is to drag each of the boxes (10) to the working area (2) of the machine.

**[0030]** The conveyor track (4) can also be made up of continuous belts or any other means of transportation, as long as it leaves open spaces between the upper area and the lower area, such that the aforementioned elevator mechanisms (6) can act.

**[0031]** Once the dimensions and positioning of the box (10) have been confirmed in the station (5) for reading dimensions, the pushers (8) transport it to the working area (2). During the displacement, a first gluing device is responsible for applying glue in the upper sections of the two sides of the box (10) parallel to the direction of movement. The gluing device can be made up of rollers in contact with the respective glue tanks thereof and located on both sides of the box (10) in the positions defined in the station (5) for reading dimensions, such that the very movement of the box (10) activates the movement of the rollers that, while they start being soaked in glue on one side, start gluing on the other. The gluing device can also be made up of glue applicator guns that are activated as a box (10) passes. The gluing device is not represented in the figures.

**[0032]** In a portion of the working area (2) parallel to

that of the movement of the boxes (10), there is, as represented in Figure 4, a lid feeder (9) together with a mechanical arm (19) that incorporates hydraulically activated vacuum suction cups (11). By means of a rotating movement of the mechanical arm (19), the suction cups (11) are positioned on the surface of the lid (9) that is going to be extracted and, by creating a vacuum, the lid (9) is adhered to the suction cups (11), the mechanical arm (19) returning to the original position thereof with the lid (9) adhered.

**[0033]** The machine also incorporates a second gluing device that applies glue on the flaps of the lid (9) located perpendicular to the direction of movement of the boxes (10). It should be noted that the glue is applied along the lower area of the lids (9), in other words, along the surface gripped by the suction cups (11). The second gluing device is also not shown in the figures.

**[0034]** Subsequently, once a lid (9) is selected, a lid-positioning device (12), such as the one represented in Figure 5, is responsible for moving the lid (9) by means of a lid pusher (13) from the position in the mechanical arm (19) to tracks (23) located in device (14) for putting on lids.

**[0035]** Thus, the pushers (8) have brought the box (10) to a position of the working area (2) in which it remains stopped so that a lid (9) may be placed on top of it and fastened. The four flaps of the lid (9), the four upper edges of the box (10) or two edges of the box (10) and two flaps of the lid (9) are impregnated with glue so that they may proceed to the gluing. In this position the device (14) for putting on lids meets the lid (9), which will proceed to position it in the box (10) and fold the flaps of the lid (9) to the box (10).

**[0036]** In a first embodiment, in the working area (2) there is a device (14) for putting on lids, as shown in Figure 6, configured by a vertical actuation mechanism (15) that incorporates a cross-shaped end (16) in the lower end thereof. In the two arms of the cross-shaped end (16) perpendicular to the movement of the boxes (10) there are tracks (23) for the location of a lid (9). Additionally, in each of the arms of the cross-shaped end (16) there is a folding device (17), which function is to fold each of the flaps of the lid (9) on the box (10). From the cross-shaped end (16) retractable shafts (22) protrude ending in a thrust plate (20). Two shafts (22) have been represented although a single shaft or more than two could be incorporated.

**[0037]** Each folding device (17) incorporates an actuator (21) located in the vicinity of the thrust plate (20). Upon unfolding the vertical actuation mechanism (15), the lid (9) is positioned on the box (10). As it continues to unfold, the lid (9) comes into contact with the box (10) and leaves the tracks (23). The thrust plate (20) then comes into contact with the lid (9) and exerts pressure on it and the retractable shafts (22) are contracted, such that the thrust plate (20) retracts and exerts pressure on the actuators (21), which activate the rotating movement of the folding devices (17).

[0038] Figure 7 represents a cross-sectional view of the arms of the cross-shaped end (16) that contain the tracks (23), showing details of these components.

[0039] Each of the mentioned folding devices (17) has the ability to move along the respective arm in which it is located of the cross-shaped end (16), such that they can be adapted to the dimensions of the box (10) that will have a lid put on it.

[0040] In idle position, the device (14) for putting on lids is stowed, folded in an elevated position. Upon being activated, it descends in order to place the lid (9) on the box (10), and as it continues to descend, the lid (9) is released from the tracks (23) so that the thrust plate (20) may exert pressure on the lid (9) and activate the folding devices (17), which fold the four flaps of the lid (9) on the box (10). The folding devices (17) keep exerting pressure on the flaps in order to let the glue act during a predetermined time and efficiently perform the gluing of the flaps to the box (10). After a predetermined time has elapsed, the folding devices (17) stop acting and the device (14) for putting on lids is folded again, returning to the idle position thereof. Then the pushers (8) are reactivated, transporting the box (10), with the lid (9) already glued, to the exit area (3).

[0041] In a second embodiment, as seen in Figure 2, Figure 8 and in Figures 9 and 10, in the working area (2) two devices (14) for putting on lids are arranged, in order to improve productivity. In this instance, considering a machine as compact as possible, the devices (14) for putting on lids are located in a position facing the longitudinal shaft of the conveyor track (4) and can be displaced along the tracks parallel to the conveyor track (4) along the working area (2). One of the differences with respect to the embodiment with a single device (14) for putting on lids is that, on this occasion, when one of the devices (14) for putting on lids is unfolded, with the thrust plate (20) exerting pressure on the lid (9), instead of remaining static so that later a pusher (8) may drag the box (10), the very device (14) for putting on lids drags the box, so that time is used to the fullest extent possible. Once the box has reached the exit area (3), the device (14) for putting on lids folds and returns to the original position thereof in order to act on the next lid (9). In order to ensure that the devices (14) for putting on lids do not interfere with each other and, focusing on the compactness of the machine, the devices (14) for putting on lids return to the folded position. By way of example, it is like the arrangement of two opposing "C" elements that, in order to reduce space and be able to move in parallel directions, move vertically so that the arm of one of the "C's" circulates through the cavity of the other "C".

[0042] Thus, while one of the devices (14) for putting on lids is moving into the unfolded position by exerting pressure on a lid (9) on a box (10), the other device (14) for putting on lids has finished the process and returns with the cross-shaped end (16) in the elevated position, without interfering with the other one. These two positions of the two devices (14) for putting on lids can be seen in

Figure 10. Thus, while one of the devices (14) for putting on lids is working on a lid (9), the other is ready to receive the next box (10) and work on it, increasing productivity.

[0043] The exit area (3) incorporates a conveyor track (4) for extracting the boxes (10) from the machine.

[0044] It should also be considered that the conveyor track (4), both in the supply area (1) as well as in the exit area (3), is intended to activate the movement of the boxes (10) when they are on it. This can be achieved by mechanically connecting the rollers (7) or belts that make it up to a motorized mechanism so that they drag the boxes (10) or, for example, by causing the conveyor track (4) to be in an inclined position, such that the boxes (10) move by gravity.

[0045] Finally, the machine can incorporate a micro-processor that processes the data obtained in the station (5) for reading dimensions and uses it for the rest of the components, in particular for the following two:

- for the gluing devices, so that they have information about the location in which the beads of glue are to be applied, and
- for the device (14) for putting on lids, so that it has information about the height of the box (10) for unfolding the vertical actuation mechanism (15) to the appropriate position and thus correctly locate the lid (9) and exert the appropriate pressure with the thrust plate (20).

[0046] It should be taken into account that the present invention should not be limited to 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.

## Claims

1. A machine for putting lids on boxes comprising a supply area (1) that incorporates a conveyor track (4), a working area that incorporates at least one gluing device and an exit area (3) that incorporates another conveyor track (4), the machine being **characterized in that:**

- the supply area (1) further comprises:
  - at least one mechanism with elevators (6),
  - brakes (24), and
  - a station (5) for reading dimensions,
- the working area (2) further comprises:
  - at least one device (14) for putting on lids comprising a vertical actuation mechanism (15) connected to a cross-shaped end (16) that incorporates a folding device (17) with

an actuator (21) on each of the arms and two tracks (23) on respective opposite arms,  
 - a lid-positioning device (13) configured to move a lid (9) and position it on the tracks (23) of the device (14) for putting on lids,

wherein:

- the gluing devices are configured to apply glue on at least one element to be selected between a box (10), a lid (9) and both,
- the mechanisms with elevators (6) and the brakes (24) are configured to act on the boxes (10) during a certain time, so that the boxes (10) are immobilized, creating a pause in the supply of boxes (10) to the working area (2),
- the folding devices (17) have the capacity to be positioned along the respective arms of the cross-shaped end (16), so that they are valid for different lid (9) sizes,
- the folding devices (17) are configured, once the vertical actuation mechanism (15) is unfolded, to fold flaps of a lid (9) on a box (10) and maintain the pressure during a certain time,
- the rotating movement of the folding devices (17) for folding the flaps is activated upon exerting pressure on the actuators (21).

2. The machine for putting lids on boxes, according to claim 1, **characterized in that** it comprises:

- a mechanical arm (18) that incorporates at least one vacuum suction cup (11),
- a lid feeder (18),

wherein the mechanical arm (18) is configured to move and extract lids (9) from the feeder (18) by means of the vacuum suction cups (11).

3. The machine for putting lids on boxes, according to any of claims 1 or 2, **characterized in that** the device (14) for putting on lids comprises a thrust plate (20) fastened by means of at least one retractable shaft (22) at the cross-shaped end (16) and configured to retract and exert pressure on the actuators (21) upon making contact with a lid (9) through the unfolding of the vertical actuation mechanism (15), activating the rotating movement of the folding devices (17).

4. The machine for putting lids on boxes, according to any of claims 1 to 3, **characterized in that** it comprises two devices (14) for putting on lids capable of moving along tracks parallel to the conveyor track (4) through the working area (2) and configured to act simultaneously on the lids (9).

5. The machine for putting lids on boxes, according to

claim 4, **characterized in that** the devices (14) for putting on lids are located in positions facing each other with respect to the longitudinal shaft of the conveyor track (4) and they are configured to be displaced with the vertical actuation mechanism (15) in the unfolded position, exerting pressure on the lid (9) of a box (10) in one direction, and in the folded position in the return direction, so that they do not interfere with each other.

6. The machine for putting lids on boxes, according to any of the preceding claims, **characterized in that** it comprises a microprocessor configured to receive the data obtained in the station (5) for reading dimensions and make it accessible, by means of electrical or wireless connection, to the gluing devices and to the device (14) for putting on lids, so that they may obtain data on the position and the dimensions of the box (10).
7. The machine for putting lids on boxes, according to claim 6, **characterized in that** the gluing devices are positioned based on the data received by the microprocessor in the station (5) for reading dimensions.
8. The machine for putting lids on boxes, according to claim 6, **characterized in that** the devices (14) for putting on lids unfold the vertical actuation mechanisms (15) to the appropriate position based in the data received by the microprocessor in the station (5) for reading dimensions

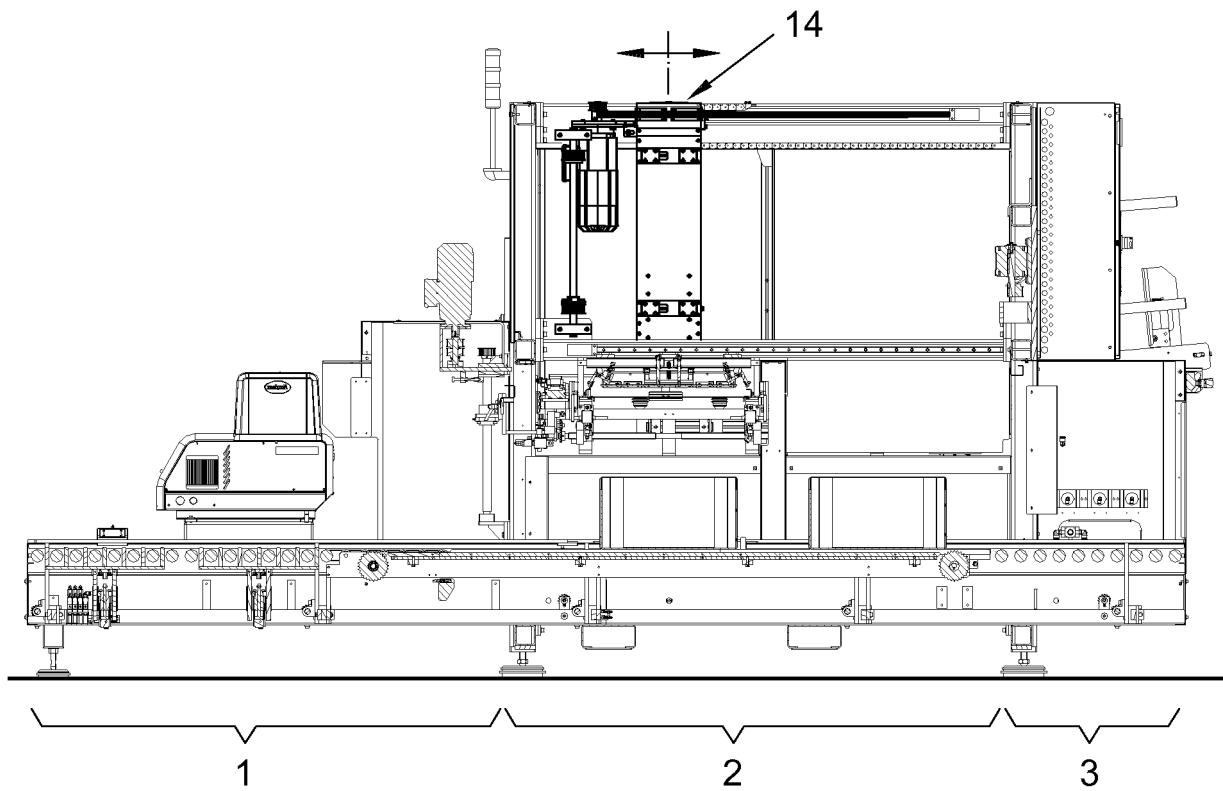


FIG. 1

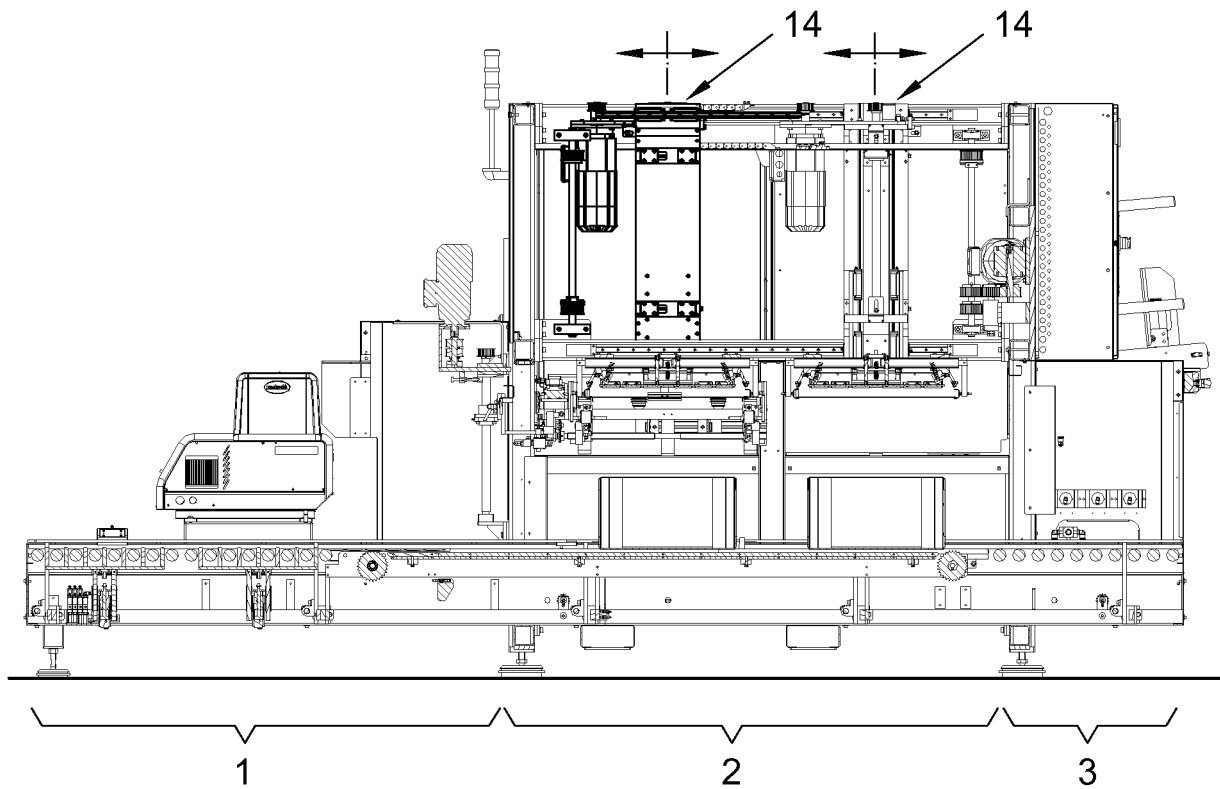


FIG. 2



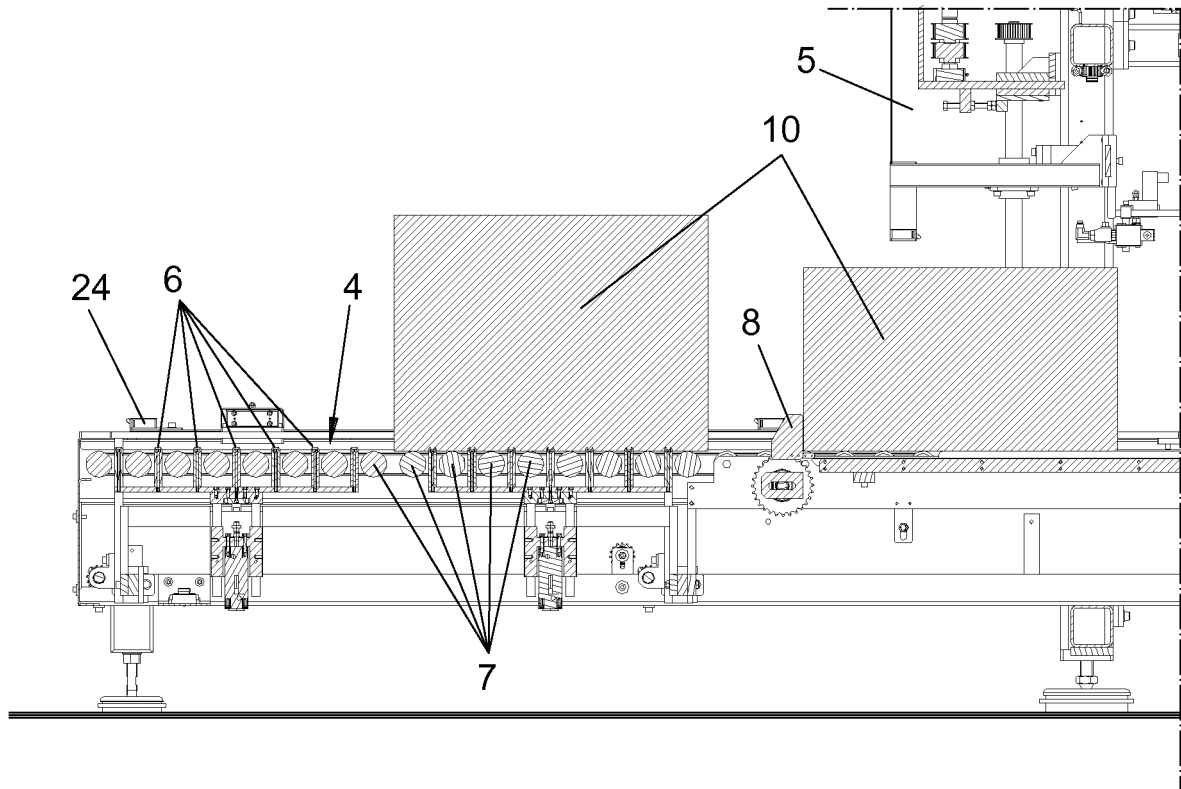


FIG. 3

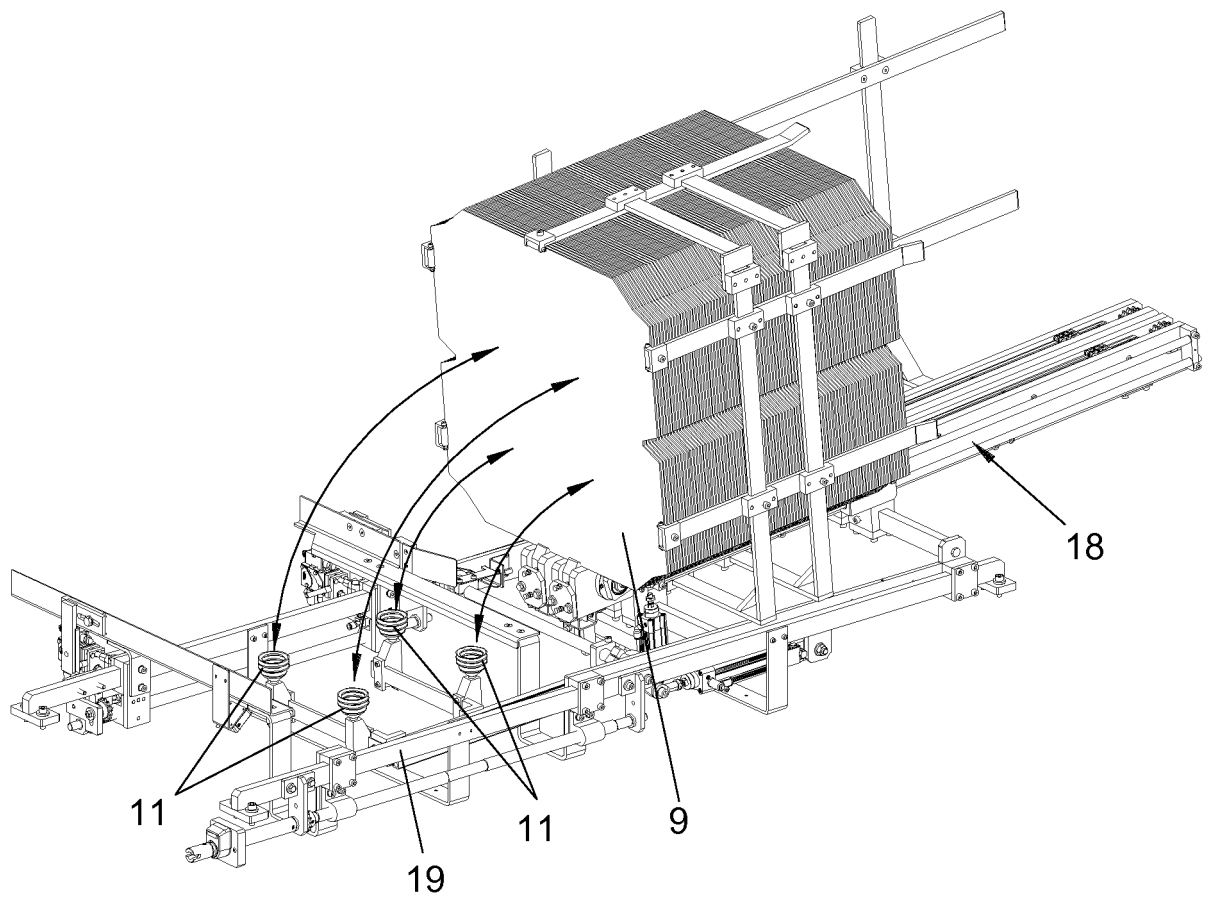


FIG. 4

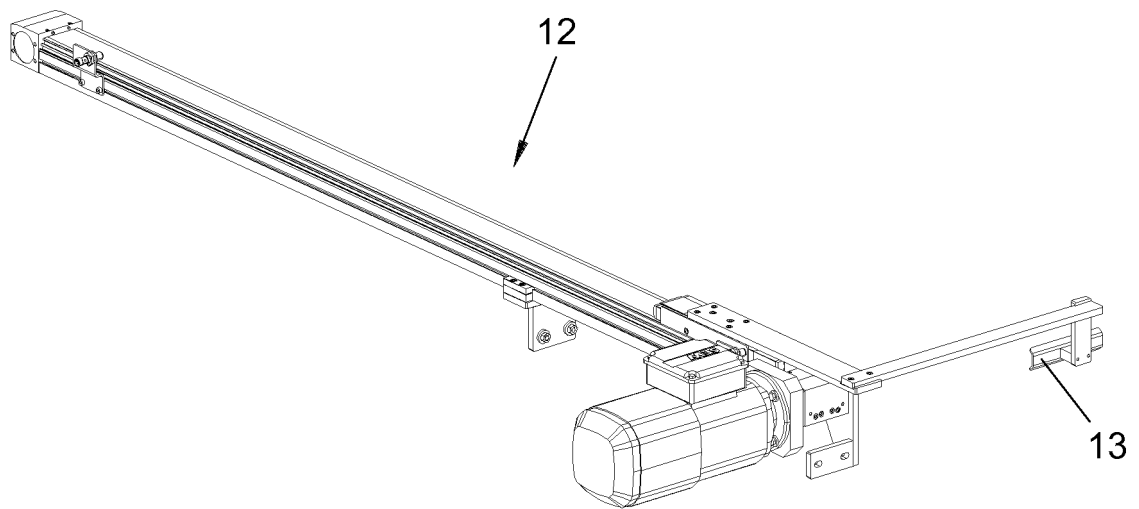


FIG. 5

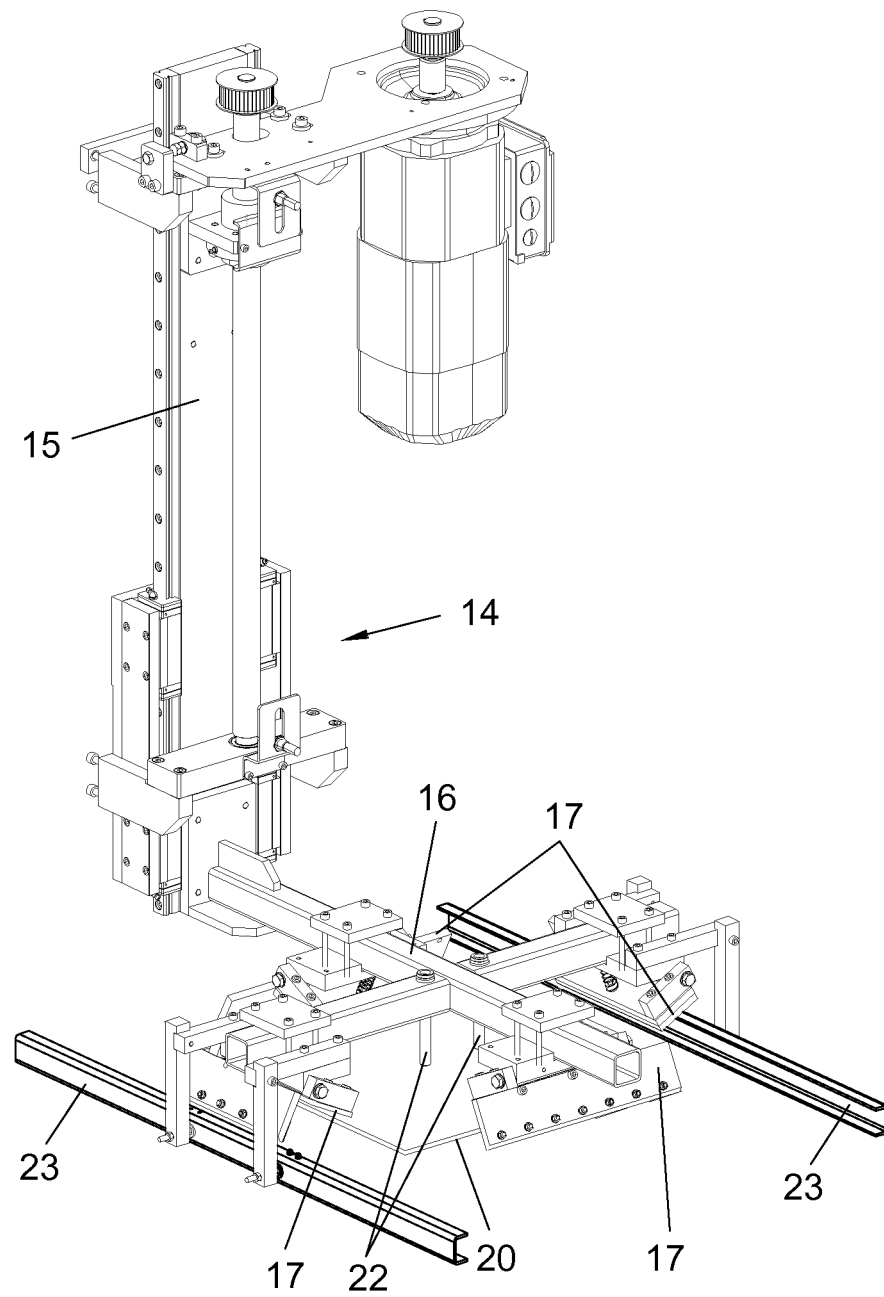
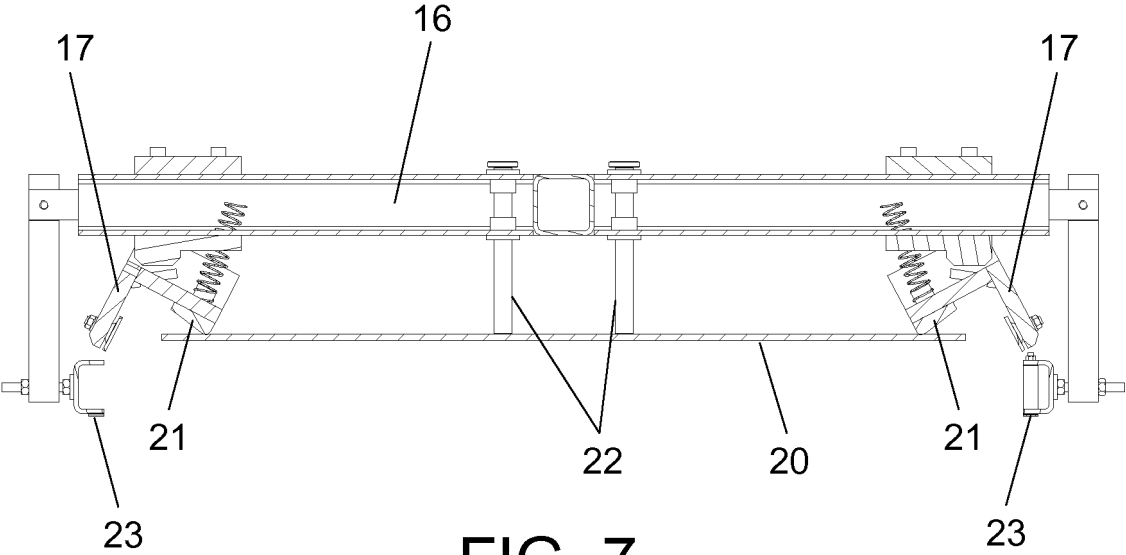


FIG. 6



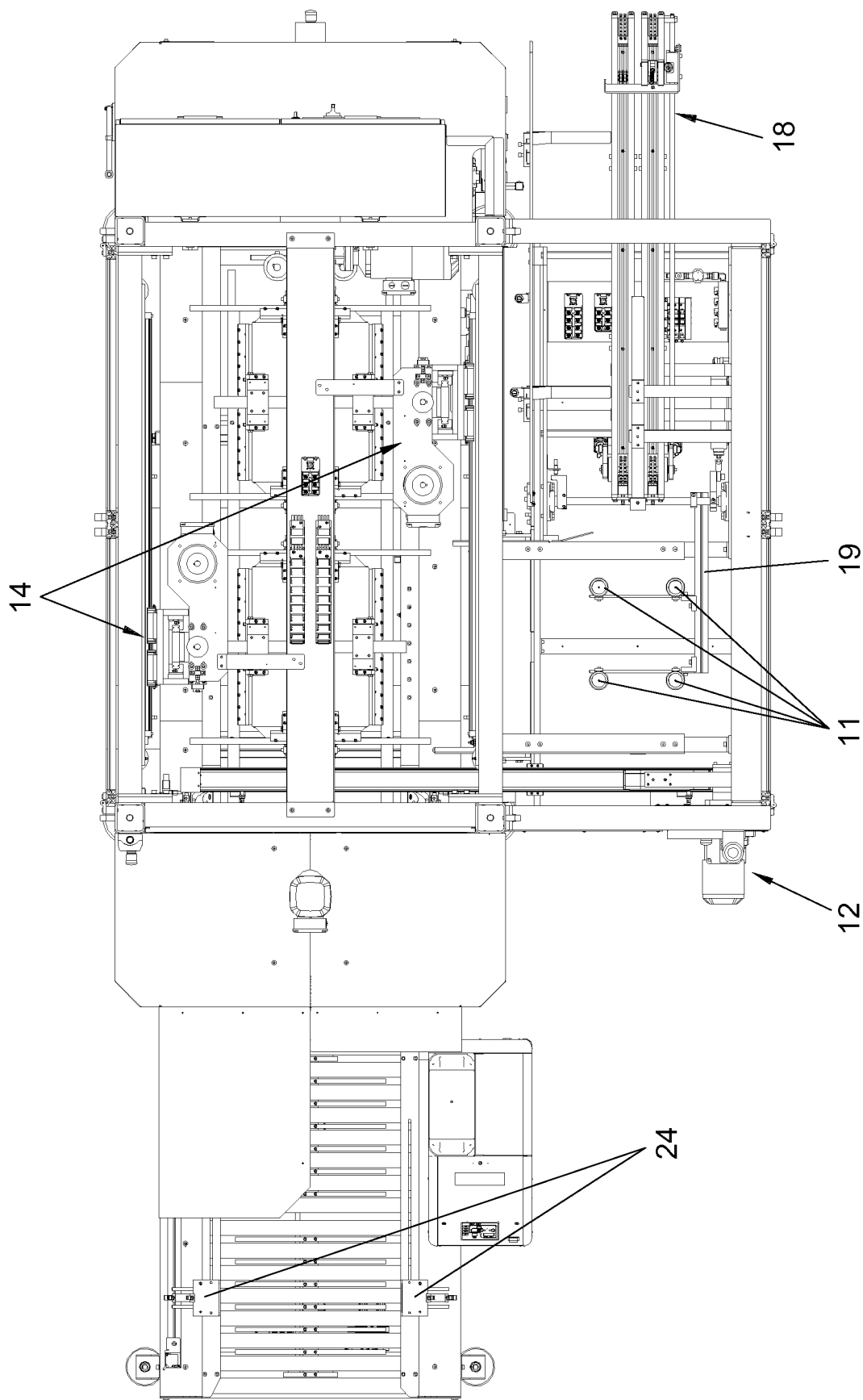
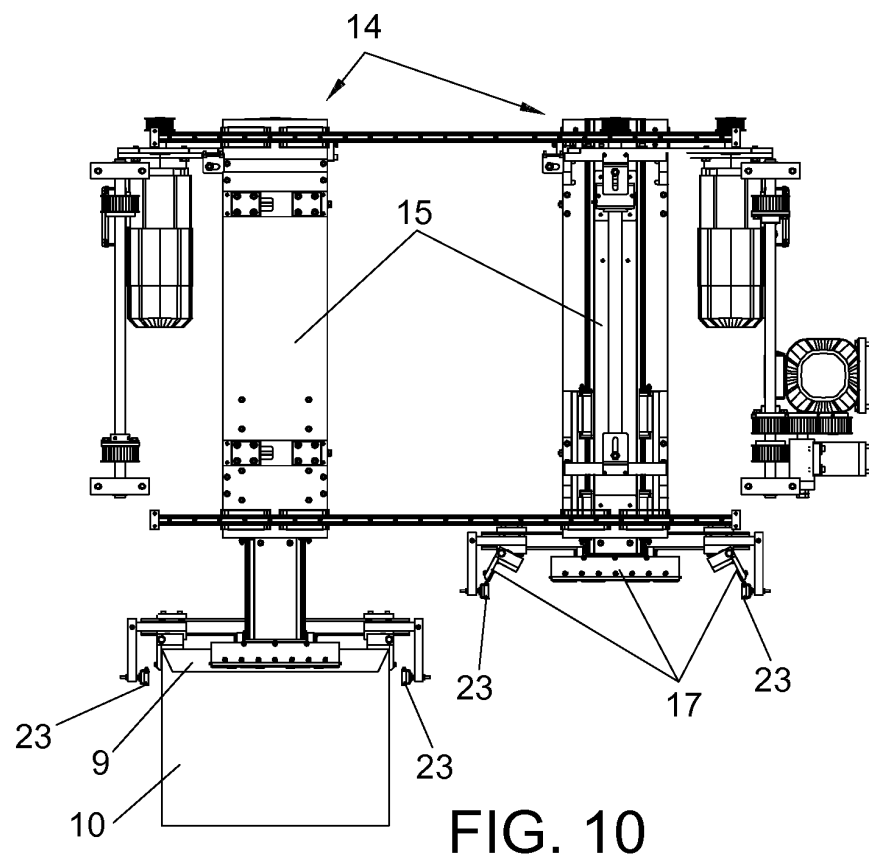
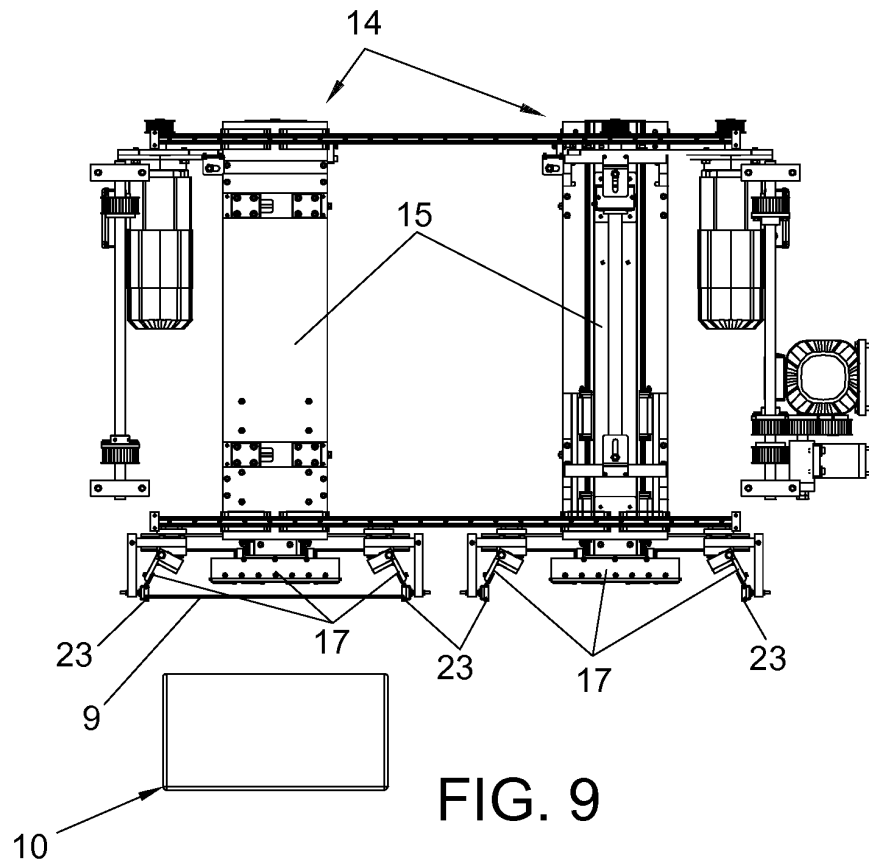


FIG. 8



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/ES2016/070247

## A. CLASSIFICATION OF SUBJECT MATTER

**B65B7/28** (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)

**B65B**

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

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6048421 A (CAPITAL FORMATION INC) 11.04.2000, column 4, line 60 – column 7, line 13; figures.	1-3,6-8
Y	US 3913300 A (CHAMPION INT CORP) 21.10.1975, column 3, line 56 – column 12, line 18; figures.	1-3,6-8
A	WO 02096755 A1 (US POSTAL SERVICE) 05.12.2002, abstract; paragraph 27; figures.	1-8
A	US 5369939 A (MOEN IND INC) 06.12.1994, the whole the document.	1-8
A	US 2014073497 A1 (MACK MICHAEL A; HUANG JINDAI; WEXXAR PACKAGING INC) 13.03.2014, abstract; figures.	1-8

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

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Date of the actual completion of the international search  
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## INTERNATIONAL SEARCH REPORT

International application No.

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