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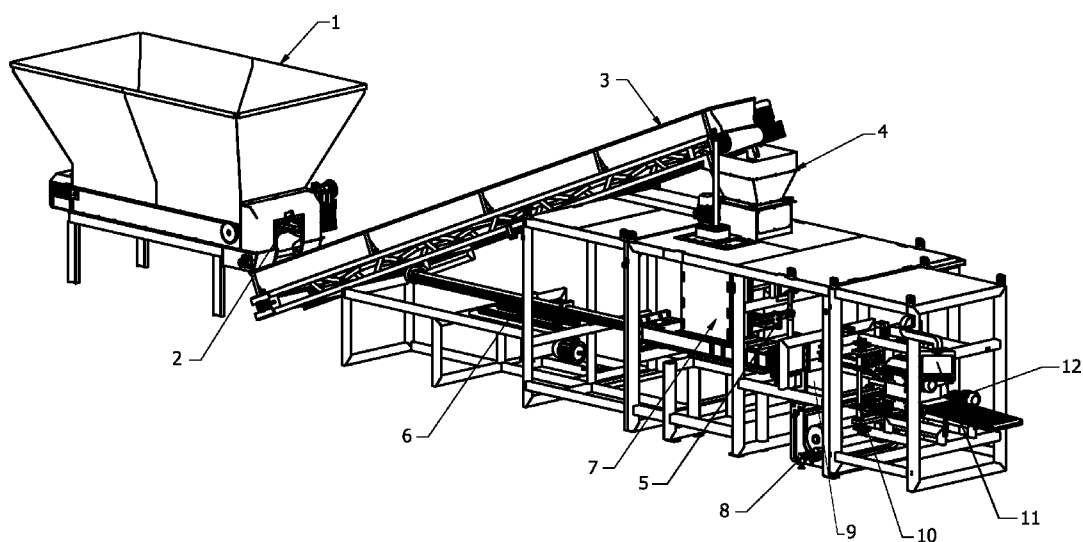


FIGURE 1

(57) Abstract: The invention relates to a packaging system for the vacuum compression of coarse-chipped materials, such as ration feed, corn silage, grain silage, wood or plant shavings, waste pulp from processed fruits and vegetables, with minimum labor, in a serial manner.



DESCRIPTION

A PACKAGING SYSTEM FOR RATION FEED, SAWDUST AND PULP

TECHNICAL FIELD

5 The invention relates to a packaging system for the vacuum compression of coarse-chipped materials, such as ration feed, corn silage, grain silage, wood or plant shavings, waste pulp from processed fruits and vegetables, with minimum labor, in a serial manner.

10 BACKGROUND

 Vacuum packaging is the process of removing the air inside the package before making it airtight. The objective here is to increase the shelf life of food and reduce the space occupied by the contents with more flexible packaging molds by removing oxygen from the package. Minimizing the remaining oxygen limits bacterial formation, extending the shelf life from 5 to 10 times. Additionally, it preserves the taste and texture of the product, prevents the evaporation of volatile compounds, and protects against freezer burn due to dry, cold air.

 The machines currently available in the market are not capable of providing sufficient compression and vacuum sealing. As a result, it becomes challenging to preserve the manufactured product after packaging. Moreover, the production capacities of existing packaging machines do not exceed two or three packages per minute. Additionally, the use of manual labor in many production systems increases labor costs.

25 AIM OF THE INVENTION

 The purpose of the invention is to vacuum compress and package coarse-chipped products, processed food waste separated as waste, ration used as animal feed, or any type of silage products with the minimum possible packaging material and labor, in a maximum number.

30 Another aim of the invention is to increase the production capacity per minute by incorporating an intermediate storage section within the production process.

 Another objective of the invention is to increase the production capacity per minute by utilizing a super-fast hydraulic system and a proportional valve in this

system. This allows for adjusting the return speed of the piston after compression, facilitating the vacuum sealing of the package.

Another objective of the invention is to ensure the optimal folding of the packaging and the ideal establishment of the vacuum ratio inside the package by
5 designing the compression piston rod to be compatible with a vacuum regulator.

Another objective of the invention is to ensure that the packaging to be used for packaging is sealed in a manner that prevents air intake.

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25 The corresponding numbers for the references given in the figures:

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- 2. Bunker
 - 2.1 Bunker drive motor
 - 2.2 Tracked feeding chains
 - 30 2.3 Bunker outlet
 - 2.4 Drive gear
 - 2.5 Idler gear
- 3. Feeding belt level sensor
- 4. Feeding belt

- 4.1 Feeding conveyor belt
- 4.2 Feeding belt drive motor
- 4.3 Driven drum
- 4.4 Idler drum
- 5 5. Weighing unit
 - 5.1 Weighing chamber
 - 5.2 Weight sensor
 - 5.3 Scale flap
 - 5.4 Flap pistons
 - 10 5.5 Flap open/close sensors
- 6. Spiral feeder
 - 6.1 Spiral drive motors
 - 6.2 Conveyor spiral
- 7. Hydraulic power unit
 - 15 7.1 High-Flow, High-Pressure Hydraulic Pump-Motor
 - 7.2 Press Piston Proportional Valve
 - 7.3 High-Flow Hydraulic Pump-Motor
 - 7.4 Compression Piston Proportional Valve
- 8. Press Unit
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 - 8.4 Compression point sensor
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 - 25 8.6 Front storage flap
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 - 8.8 Press piston
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 - 8.9.2 Vacuum flap
 - 30 8.9.3 Discharge line
 - 8.9.4 Vacuum regulator
 - 8.10 Press chamber
 - 8.11 Press piston starting point
 - 8.12 10 cm back sensor

- 8.13 Press point sensor
- 8.14 Speed control sensor
- 8.15 Package exit sensor
- 8.16 Press chamber cover
- 5 8.17 Cover drive unit
- 8.18 Cover open sensor
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- 9. Packaging feeding system
- 10 9.1 Packaging coil
- 9.2 Packaging feeding motor
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- 9.4 Packaging tension roller
- 9.5 Packaging nylon
- 15 9.6 Packaging feeding drum
- 10. Collar system
- 10.1 Packaging forming unit
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- 10.3 Long edge adhesive
- 20 11. Adhesive System
- 11.1 Cold Jaw Pistons
- 11.2 Upper Cold Jaw
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- 12.3 Belt Operation Control Sensor
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- 13. Packaging Adhesion
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- 13.2 Packaging First Short Edge Adhesion
- 13.3 Packaging Long Edge Adhesion
- 13.4 Packaging Second Short Edge Folding

14. Packaged Product

- 14.1 Package
- 14.2 Package First Short Edge
- 14.3 Package Second Short Edge
- 14.4 Package Long Edge

10 DETAILED DESCRIPTION OF THE INVENTION

A packaging system, which is the subject of the invention, comprises a user control panel (1), a bunker (2), a feeding belt level sensor (3), a feeding belt (4), a weighing unit (5), a spiral feeder (6), a hydraulic power unit (7), a press unit (8), a packaging feeding system (9), a collar system (10), an adhesive system (11), and exit belts (12). The operational principles of each component are detailed below.

The User Control Panel (1):

The control panel (1) serves as an interface, enabling the user to input data for processing by the PLC processor through buttons or a touch screen. This allows the application of values related to operations such as operating speed, production quantity, and package size. The working speeds or operating ranges of the hardware described in detail below can vary according to preferences.

The Bunker (2):

The bunker (2) chamber further comprises a bunker outlet (2.3), an idler gear (2.5), a drive gear (2.4), tracked feeding chains (2.2), and a bunker drive motor (2.1). The tracked feeding chains (2.2), attached between the idler gear (2.5) and the drive gear (2.4) and serving as a conveyor, are driven by the bunker drive motor (2.1). The speed of the bunker drive motor (2.1) is controlled by the PLC processor through data inputs made by the operator via the user control panel (1) and the speed control processor on the electrical panel. The drive motor (2.1), controlled by the speed control processor, moves the tracked feeding chains (2.2) through the drive gear (2.4), transporting the product to the bunker outlet (2.3) and pouring it onto the feeding belt (3).

The feeding belt level sensor (3):

The feeding belt level sensor (3) measures the level of the product poured onto the feeding belt (4) from the bunker outlet (2.3) and sends data to the PLC processor. Based on the received data, the PLC processor adjusts the speed of the bunker drive motor (2.1) by controlling the speed control driver. The measured distance by the feeding belt level sensor (3) is calibrated to consider the feeding belt (4) as zero. The sensor (3) emits infrared radiation, measures the return speed of the radiation, and checks whether the current distance has shortened or not based on this speed. Depending on changes in this speed, within the calibration, the sensor makes an assumption about the distance and sends this data to the PLC processor.

The feeding belt (4):

The feeding transport belt (4.1) further comprises a driven drum (4.3), a driven motor (4.2), and an idler drum (4.4). The feeding transport belt (4.1) is attached between the driven drum (4.3) and the idler drum (4.4) and is driven by the feeding belt drive motor (4.2). The PLC processor controls the operation and speed of the feeding belt (4) through the feeding belt motor speed control driver based on the data sent from the weighing unit (5) and the data entered from the control panel (1).

The weighing unit (5):

The weighing unit (5) comprises a weighing chamber (5.1), a weight sensor (5.2), a scale flap (5.3), flap pistons (5.4), and open/closed sensors for the flap (5.5). Based on the data received/entered into the PLC processor, the scale flap (5.3) is moved by the flap pistons (5.4) to hold it either open or closed. The status of the scale flap (5.3) is controlled by the open/closed sensors (5.5). The user enters the weight of the product to be weighed in the weighing unit (5) through the interface on the control panel (1). The weight sensor (5.2) measures the weight of the product entering the weighing chamber (5.1) and transmits this information to the PLC processor.

The spiral feeder (6):

The spiral feeder (6) comprises three conveyor spirals (6.2) and spiral drive motors (6.1). The PLC processor operates the spiral drive motors (6.1) using electrical control elements, and the conveying process is carried out with the conveyor spirals

(6.2) in the known manner of the art. The operation is stopped based on the value entered by the user through the interface on the control panel (1).

The hydraulic power unit (7):

5 The hydraulic power unit (7) comprises a high-flow and high-pressure hydraulic pump-motor (7.1), a proportional valve for the press piston (7.2), a high-flow hydraulic pump-motor (7.3), and a proportional valve for the compression piston (7.4). In the system subject to the invention, separate pump-motor configurations are used for the compression piston (8.1) and the press piston (8.8) since the pistons travel 50-130 cm
10 per second. To move the press piston (8.8) used in the pressing process, the high-flow and high-pressure hydraulic pump-motor (7.1), the speed control driver, and the proportional valve for the press piston (7.2) are utilized. Based on the values entered into the interface on the control panel (1), the PLC processor controls the speed control driver and the proportional control valve (7.2), moving the press piston (8.8) with a
15 minimum precision of 10 ms and flow rates between 0-270 liters/min.

 To move the compression piston (8.1), the high-flow hydraulic pump-motor (7.3) and the proportional control valve (7.4) are used. Based on the values entered into the interface on the control panel (1), the PLC processor controls the proportional valve for the compression piston (7.4), enabling the compression piston (8.1) to be controlled at
20 variable speeds with constant pressure.

The press unit (8):

 The press unit (8) comprises a compression piston (8.1), a compression piston start point sensor (8.2), a waiting point sensor (8.3), a compression point sensor (8.4),
25 a front storage chamber (8.5), a front storage flap (8.6), a compression chamber (8.7), the press piston (8.8), a press rod (8.9), a press chamber (8.10), a press piston start point sensor (8.11), a 10 cm back sensor (8.12), a press point sensor (8.13), a speed control sensor (8.14), a package exit sensor (8.15), a press chamber cover (8.16), a cover drive unit (8.17), an cover open sensor (8.18), a cover closed sensor (8.19), and
30 a front storage flap open/closed sensor (8.20). The role of the sensors used in the unit is to send data to the PLC processor to ensure the harmonious operation of the systems used in the unit.

 The task of the compression piston (8.1) is to compress the product poured into the compression chamber (8.7), wait at the compression point sensor (8.4) until the

sensor sends data to the PLC processor, initiating the pressing process of the press piston (8.8). Subsequently, it returns to the starting point and waits for the next product to be poured into the front storage chamber (8.5). The compression piston (8.1) performs all these movements by the evaluated data from the start point sensor (8.2), the waiting point sensor (8.3), the front storage flap open/closed sensor (8.20), the compression point sensor (8.4), the press point sensor (8.13), and the data from the spiral feeder (6). This evaluation is done by the PLC processor, which controls and operates the hydraulic power unit (7).

The task of the compression piston starting point sensor (8.2) is to provide data to the PLC processor when the compression piston (8.1) reaches this point. This data triggers the operation of the spiral feeder (6) and the pouring of the product waiting in the weighing chamber (5.1) into the front storage chamber (8.5).

The waiting point sensor (8.3) sends data to the PLC processor to optimize time by allowing the compression piston (8.1) to travel half of its path in advance and wait at this point, instead of waiting at the compression piston start point (8.2) after the product has been poured into the front storage chamber (8.5).

The compression point sensor (8.4) detects when the compression piston (8.1) has reached the compression point and sending data to the PLC processor to initiate the pressing process.

The front storage chamber (8.5) and the front storage flap (8.6) serve as an intermediate station between the weighing unit (5) and the compression chamber (8.7), optimizing the time spent during the discharge of the product by the spiral feeder (6). The front storage flap (8.6), mounted on the chamber (8.5), holds the product on the front storage flap (8.6) rather than on the weighing unit (5). This results in a time saving of 2-5 seconds per package from the production time.

The front storage flap open/closed sensor (8.20) sends data to the PLC processor to initiate the operation of the spiral feeder (6). This is done to pour the product to be packaged from the weighing unit (5) to the spiral feeder (6) and to enable the forward movement of the compression piston (8.1) towards the compression chamber (8.7).

The compression chamber (8.7) serves as the chamber where the products to be pressed are poured in front of the pressing ram (8.9). The products are compressed by the compression piston (8.1) in this chamber before being pressed, preparing them for the pressing process.

The task of the pressing piston (8.8) is to move forward when the product to be packaged is compressed by the compression piston (8.1) in the compression chamber (8.7) while waiting at the starting point (8.11). It presses the products and moves the pressed product through the collar system (10) into the internally sealed packaging with short and long edges, placing it between the exit belts (12). During its return, it vacuums the air inside the packaged product and returns to the starting point, assisting the vacuum sealing of the open edge of the package through the adhesive system (11). The press piston (8.8) performs all these movements by evaluating the data from the compression point sensor (8.4), the press piston starting point sensor (8.11), the 10 cm back sensor (8.12), the press point sensor (8.13), the speed control sensor (8.14), the package exit sensor (8.15), the cover open sensor (8.18), and the cover closed sensor (8.19) through the PLC processor, ensuring the control and operation of the hydraulic power unit (7).

The press rod (8.9) is a specially designed block piece attached to the end of the press piston (8.8) shaft for compressing the products to be packaged and transporting them to the exit belts (12). With the special design, a vacuum flap (8.9.2) is placed in front of the head, and a vacuum regulator (8.9.4) is placed behind the head. These two parts are connected inside the head through a discharge line (8.9.3). During the backward movement of the press rod (8.9), excess vacuum that could lead to the vacuuming of the package and the disruption of the folding form in the bonding area is adjusted to the desired level by the vacuum regulator (8.9.4). The negative pressure created inside the package with the atmosphere is maintained at the desired level through the designed vacuum regulator (8.9.4), discharge line (8.9.3), and vacuum flap (8.9.2) attached to the press head.

The press chamber (8.10) is a reinforced chamber where the products to be packaged are compressed.

The press piston starting point sensor (8.11) is responsible for sending data to the PLC processor when the press piston (8.8) reaches this point, causing the front storage flap (8.6) to open, the compression piston (8.1) to reach the compression point sensor (8.4), and initiating the forward movement of the press piston (8.8) towards the press point sensor (8.13).

The task of the press point sensor (8.13) is to send data to the PLC processor when the press piston (8.8), during the pressing process, moves forward from the press piston starting point (8.11) to the press point sensor (8.13). This action triggers the

compression piston (8.1) to move back to the start point (8.2), initiates the waiting time at the press point sensor (8.13) for the press piston (8.8), and, at the end of the specified time, moves it back, opening the press chamber cover (8.16).

The task of the press chamber door (8.16) and the door drive unit (8.17) is to ensure that, during the pressing process, except for the side where the products come in, the press chamber (8.10) should be completely closed in a box shape to allow the press piston (8.8) to compress the products. After the pressing process is completed, a mechanism for the press chamber cover (8.16) has been designed to open/close on one side, allowing the pressed product to be removed from the press chamber. The data sent by the press point sensor (8.13) is processed by the PLC processor to control the opening and closing of the press chamber cover (8.16) through the cover drive unit (8.17) and control elements. The status of whether the press chamber cover (8.16) is open or closed is transmitted to the PLC processor by the cover open sensor (8.18) and cover closed sensor (8.19).

The task of the cover open sensor (8.18) and cover closed sensor (8.19) is to send information to the PLC processor about whether the press chamber cover (8.16) is open or closed.

The task of the 10 cm back sensor (8.12) is to send data to the PLC processor to stop the backward movement of the press piston (8.8) when it reaches the front of the 10 cm back sensor (8.12) and to initiate forward movement when a signal is received from the cover open sensor (8.18).

The task of the speed control sensor (8.14) is to send data to the PLC processor to reduce the forward speed of the press piston (8.8) when it reaches the front of the speed control sensor (8.14). This reduction in speed is necessary to prevent the opened end of the pressed product from unfolding when it meets the sealed end of the packaging (9.5).

The product exit sensor (8.15) is responsible for sending data to the PLC processor to limit the maximum point where the press piston (8.8) can move forward and initiate its backward movement.

Packaging Feeding System (9):

The packaging feeding system (9) comprises a packaging coil (9.1), a packaging feeding motor (9.2), a packaging reserve limit sensor (9.3), a packaging tension roller (9.4), and a packaging feeding drum (9.6).

The task of the packaging feeding drum (9.6) is to feed the packaging nylon (9.5), used in the packaging of products, into the packaging reservoir with the drive it receives from the packaging feeding motor (9.2). The packaging feeding motor (9.2) is controlled by motor control elements controlled by the PLC processor, allowing it to
5 operate in a way that keeps the reservoir filled.

The task of the packaging tension roller (9.4) is to hold the packaging nylon (9.5) in the reservoir in a tense manner.

The task of the packaging reserve limit sensor (9.3) is to send data to the PLC processor, allowing the motor control elements in the electrical panel to start the
10 packaging feeding motor (9.2).

Collar System (10):

The collar system (10) comprises a packaging forming unit (10.1), a discharge channel (10.2), and a long-edge adhesive unit (10.3). The task of the packaging
15 forming unit (10.1) is to position the packaging nylon (9.5) on the collar in a way that the long edges overlap, ready to be adhered together. The long-edge adhesive unit (10.3) comprises a resistive wire moved by a pneumatic piston, which heats up when electrically powered. The discharge channel (10.2) in the collar body ensures the release of pressurized air generated in the closed space within the collar to the
20 atmosphere as the press piston (8.8) moves the product out of the collar towards the exit belts.

Adhesive System (11):

The adhesive system (11) comprises cold jaw pistons (11.1), an upper cold jaw
25 (11.2), a lower cold jaw (11.3), an upper adhesive jaw (11.4), a lower adhesive jaw (11.5), adhesive jaw pistons (11.6), and a cutting wire (11.7). The upper cold jaw (11.2) and the lower cold jaw (11.3) compress the area to be adhered during the bonding of the short edge of the packaging nylon (9.5) to keep it stationary. The cold jaw pistons (11.1), when moved using the control elements of the PLC processor, actuate the cold
30 jaws. The upper adhesive jaw (11.4) and lower adhesive jaw (11.5), equipped with resistance wires that heat up when electrically charged, perform the bonding of the packaging nylon (9.5) and the cutting process of the outgoing packaged end. The adhesive jaw pistons (11.6) move the adhesive jaws by being actuated through the control elements of the PLC processor.

Exit Belt (12):

The exit belts (12) comprise the lower exit belt (12.1), upper exit belt (12.2), belt operation control sensor (12.3), and belt drive motors (12.4). The task of the belt operation control sensor (12.3) is to determine the position of the package between the exit belts (12) and send data to the PLC processor. The PLC processor processes the data from the sensor and the values entered in the control panel, then controls the belt drive motors (12.4) to move forward or backward, or to stop, using the motor control driver. The role of the exit belts (12) is to position the packaged package according to the commands from the PLC processor using the belt drive motors.

Within the system, the products to be packaged are filled into the bunker (2) using methods preferred by the user. The user enters the weight value of the product to be packaged through the interface on the control panel (1). The products inside the bunker (2) are transported to the bunker outlet (2.3) by tracked feeding chains (2.2) and poured onto the feeding conveyor belt (4.1). To ensure a continuous and uniform level of the product poured onto the feeding conveyor belt (4.1), the feeding belt level sensor (3) controls the speed of the bunker drive motor (2.1).

The feeding conveyor belt (4.1) transfers the products to the weighing unit (5), where the weight is measured in real-time. When the product poured into the weighing chamber (5.1) reaches the set package weight, the feeding conveyor belt (4.1) stops working and waits in a filled state. When the compression piston (8.1) reaches the compression piston starting point sensor (8.2) and the front storage flap (8.6) is closed, the spiral feeder (6) starts operating. Simultaneously, the weighing flap (5.3) opens, pouring the product in its chamber into the spiral feeder (6), and then closes again. With the closure of the scale flap (5.3), the weighing unit (5) activates the feeding belt (4), filling the weighing chamber (5.1) again with the product intended for packaging.

The spiral feeder (6), which transfers the poured products to the front storage chamber (8.5), stops after the duration entered in the control panel interface. With the stoppage of the spiral feeder (6), the compression piston (8.1) moves forward by the hydraulic power unit (7) until it reaches the waiting point (8.3) and stops. Thus, the product to be packaged gets in a waiting position on the front storage flap (8.6) in the front storage chamber (8.5). The compression piston (8.1) is also in a waiting position at the waiting point (8.3). This allows a time saving of 2-5 seconds per package since the product that would normally wait in the weighing chamber (5.1) is waiting in the

front storage chamber (8.5), and the compression piston (8.1), which would normally wait at the starting point (8.2), is also waiting at the waiting point (8.3).

With the arrival of the press piston (8.8) at the starting point of the press piston starting point (8.11), the front storage flap (8.6) opens, and the products are poured
5 into the compression chamber (8.7). The compression piston (8.1) moves forward to the compression point sensor (8.4) and stops. After confirming that the compression piston (8.1) is at the compression point sensor (8.4) and the press chamber cover (8.16) is closed, the press piston (8.8) is moved forward to the press point sensor (8.13) by the hydraulic power unit (7). The product is conveyed from the compression
10 chamber (8.7) to the press chamber (8.10), and the pressing process begins between the press rod (8.9) and the press chamber cover (8.16). When the press piston (8.8) reaches the press point and is detected by the press point sensor (8.13), the compression piston (8.1) is moved in the reverse direction to return to the compression piston starting point (8.2) and comes to a stop. As the compression piston (8.1) moves
15 backward, when it passes in front of the waiting point sensor (8.3), the sensor sends data to the PLC processor to close the front storage flap (8.6), and the flap is closed. With the closure of the flap and the arrival of the compression piston (8.1) at the compression piston starting point (8.2), the spiral feeder (6) operates. The scale flap (5.3) opens, and the product, which has been weighed and is ready in the scale
20 chamber (5.1), is poured into the front storage chamber (8.5). The compression piston (8.1) moves to the waiting point sensor (8.3) and begins waiting.

When the press piston (8.8) reaches the press point sensor (8.13); the press chamber cover (8.16) begins to open, and after the waiting time entered by the user in the control panel (1) interface, the press piston (8.8) starts moving backward.

25 The press piston (8.8) moves back to the front of the 10 cm back sensor (8.12) and stops. With the information that the press chamber cover (8.16) is open, it moves forward to insert the pressed product into the packaging nylon (9.5) through the collar system (10). Meanwhile, the packaging nylon (9.5) is ready in a manually sealed state with the packaging long edge adhesion (13.3) and the packaging first short edge
30 adhesion (13.2) from the previous section or from the initial operation. During the forward movement of the press piston (8.8) and the pressed product, the pressurized air generated inside the collar system is released to the atmosphere through the discharge channel (10.2) added to the collar body. This is done to prevent any damage to the packaging nylon (9.5), which has its long edge (13.3) and the first short edge

(13.2) sealed, within the collar system. The speed of the press piston (8.8) decreases to a low speed before the press rod (8.9) passes in front of the speed control sensor (8.14) while pushing the pressed product through the collar system (10). This reduction in speed prevents deformation of the first short edge (13.2) sealing when it meets the packaging.

The press piston (8.8) pushes the pressed product, which has met the packaging nylon (9.5), between the exit belts up to the package exit point (8.15). Meanwhile, the packaging feeding system (9) pulls the packaging nylon (9.5) waiting in the reservoir to the collar system (10) with a constant tension through the packaging tension roller (9.4). The decreasing amount of packaging nylon (9.5) in the packaging reservoir is replenished by the rotation of the packaging feeding drum (9.6) and the packaging feeding motor (9.2) turning the packaging coil (9.1). The packaging coil (9.1) continues to unwind until the packaging reserve limit sensor (9.3) is detected. Once the sensor (9.3) is detected, the feeding process is stopped, and the packaging nylon (9.5) for the next package is prepared.

The press piston (8.8) stops when it is in front of the package output sensor (8.15), and the compressed product (13.1) passes the belt operation control sensor (12.3) between the exit belts (12) and stops together with the exit belts (12). After the press piston (8.8) starts its reverse movement, the exit belts (12) also start to reverse. During its backward movement, the press piston (8.8) acts as an air suction piston to vacuum the air inside the compressed product (13.1), which is sealed by gluing the long edge (13.3) and the first short edge (13.2) of the package. During this vacuuming process, both the air inside the package (14.1) is removed and the second short edge (13.4) of the package is folded before sealing the second short edge (14.3). When the package (14.1) passes in front of the belt operation control sensor (12.3), it is positioned in the adhesive system (11) for sealing the second short edge (14.3) and the sealing sequence starts;

1. The packaging second short edge folding (13.4) positioned between the adhesive system (11) is clamped between the upper and lower cold jaws (11.3, 11.2) driven by the cold jaw pistons (11.1).
2. The upper and lower adhesive jaws (11.5, 11.4) are closed after the time entered via the interface on the control panel (1).

3. The long edge adhesive (10.3) is pressed onto the long edges of the packaging (13.3), which are positioned one above the other on the collar system (10). The resistances on the long edge adhesive (10.3) are energized to seal the packaging long edges (13.3).

5 4. The cutting wire is energized for the time entered into the interface on the control panel (1) and cuts the packaging second short edge folding (13.4) of the package by melting with heat.

10 5. At the end of the cutting process, the resistances on the upper and lower adhesive jaws (11.5, 11.4) are energized for the time specified on the interface, the package is sealed by melting and the package second short edge (14.3) of the package (14.1) is also sealed.

6. After all edges of the package (14.1) have been sealed, the cold jaws (11.2, 11.3) are opened and the packaged (14.1) is removed from the machine as the exit belts (12) start to rotate in the forward direction.

15 When the press piston (8.8), which continues its backward movement, passes in front of the press point sensor (8.13), the press chamber cover (8.16) receives the close command and starts to close. The press piston (8.8) stops when it reaches the press piston starting point (8.11) and moves forward again with the start of the next sequence.

CLAIMS

1. Packaging system comprising:

- A PLC processor,
- 5 – A control panel (1) allowing input of data for operations to be processed in the PLC processor, accessible through buttons or a touchscreen,
- A bunker (2),
- A feeding belt level sensor (3) measuring and transmitting data to the PLC processor regarding the level of products poured onto a feeding belt
- 10 (4) from a bunker outlet (2.3), and performing distance measurement,
- The feeding belt (4),
- A weighing unit (5),
- A spiral feeder (6),
- A hydraulic power unit (7),
- 15 – A press unit (8),
- A packaging feeding system (9),
- A collar system (10),
- An adhesive system (11),
- And exit belts (12).

20 2. The bunker (2) according to claim 1, characterized by comprising a bunker outlet (2.3), an idler gear (2.5), a drive gear (2.4), tracked feeding chains (2.2), and a bunker drive motor (2.1).

25 3. The feeding belt (4) according to claim 1, characterized by comprising a feeding conveyor belt (4.1), a feeding belt drive motor (4.2), a driven drum (4.3), and an idler drum (4.4).

30 4. The weighing unit (5) according to claim 1, characterized by comprising a weighing chamber (5.1), a weight sensor (5.2) that measures the weight of the product entering the weighing chamber (5.1) and transmits it to the PLC processor, a scale flap (5.3), flap pistons (5.4), and flap open/close sensors (5.5).

5. The spiral feeder (6) according to claim 1, characterized by comprising three conveyor spirals (6.2) and spiral drive motors (6.1).

6. The hydraulic power unit (7) according to claim 1, characterized by comprising a hydraulic pump-motor (7.1) for moving the pressing piston (8.8) in the pressing process, a press piston proportional valve (7.2), and a hydraulic pump-motor (7.3) for moving the compression piston (8.1), and a compression piston proportional valve (7.4).
7. The press unit according to Claim 1, characterized by comprising;
- A compression piston (8.1) that compresses the product in the compression chamber (8.7), waits at the compression point sensor (8.4) for the sensor to send data to the PLC processor, initiating the pressing process of the press piston (8.8), and subsequently returns to the starting point, awaiting the compaction of the next product into the front storage chamber (8.5),
 - A compression piston starting point sensor (8.2), which provides data to the PLC processor to activate the spiral feeder (6) and pour the product waiting in the weighing chamber (5.1) into the front storage chamber (8.5) when the compression piston (8.1) arrives,
 - A waiting point sensor (8.3) that sends data to the PLC processor to save time by taking half of the path in advance and holding at this point, instead of having the compression piston (8.1) wait at the starting point (8.2) after the product is poured into the front storage chamber (8.5),
 - A compression point sensor (8.4) that detects when the compression piston (8.1) reaches the compression point and sends data to the PLC processor to initiate the pressing process,
 - A front storage chamber (8.5) and a front storage flap (8.6), creating an intermediate station between the weighing unit (5) and the compression chamber (8.7) where the product waits, saving time during the unloading of the product by the spiral feeder (6),
 - A compression chamber (8.7) where the products to be pressed are poured in front of the pressing rod (8.9),
 - A press piston (8.8) compressing the products by moving forward when the product to be packaged is compressed in the compression chamber (8.7) by the compression piston (8.1) at the press piston starting point (8.11),

- A press rod (8.9) attached on the end of the press piston (8.8) for compressing the products to be packaged and transporting them to the exit belts (12),
- A press chamber (8.10),
- 5 – A press piston starting point sensor (8.11), when the press piston (8.8) comes, sending data to the PLC processor to initiate the opening of the front storage flap (8.6), the compression piston (8.1) reaching the compression point sensor (8.4), and the forward movement of the press piston (8.8) toward the press point sensor (8.13),
- 10 – A 10 cm back sensor (8.12) that sends data to the PLC processor to stop the forward movement of the press piston (8.8) when it comes in front and to move the press piston (8.8) forward when an open signal is received from the press room door open sensor (8.18),
- 15 – A press point sensor (8.13) that, when the press piston (8.8) moves forward from the starting point (8.11) to the pressing point (8.13) for the pressing process, initiates the movement of the compression piston (8.1) back to the starting point (8.2), starts the waiting time at the press point (8.13) for the press piston (8.8), and sends data to the PLC processor to open the press chamber door (8.16),
- 20 – A speed control sensor (8.14) that sends data to the PLC processor to reduce the forward speed when the press piston (8.8) approaches,
- A package exit sensor (8.15) that sends data to the PLC processor to limit the maximum point the press piston (8.8) can move forward and initiate its backward movement,
- 25 – A single-sided openable/closable press chamber cover (8.16) for removing the compressed product from the press chamber after the pressing process is completed,
- A cover drive unit (8.17) that opens and closes the press chamber cover (8.16) based on the command received as a result of processing the data sent by the press point sensor (8.13) by the PLC processor,
- 30 – A cover open sensor (8.18) and a cover closed sensor (8.19) that send information about the open or closed position of the press chamber cover (8.16) as data to the PLC processor,

- A front storage flap open/closed sensor (8.20), which sends data to the PLC processor to activate the spiral feeder (6), pour the product to be packaged from the weighing unit (5) into the spiral feeder (6), and enable the forward movement of the compression piston (8.1) towards the compression chamber (8.7).

8. The press rod (8.9) according to claim 7, characterized by comprising a vacuum flap (8.9.2) on its front side, a vacuum regulator (8.9.4) on its rear side to prevent vacuum excess during the backward movement of the press ram, and a discharge line (8.9.3) connecting these two parts within the rod to preserve the folding form in the gluing area during vacuuming of the package.

9. The packaging feeding system (9) according to claim 1, characterized by comprising a packaging coil (9.1), a packaging feeding motor (9.2), a packaging reserve limit sensor (9.3), a packaging tension roller (9.4), and a packaging feeding drum (9.6) that feeds the packaging nylon (9.5) used in packaging with the drive received from the packaging feeding motor (9.2) to the packaging reservoir.

10. The collar system (10) according to claim 1, characterized by comprising a packaging forming unit (10.1) that positions the packaging nylon (9.5) on the collar by overlapping its long edges for adhesive bonding, a discharge channel (10.2) that allows the pressurized air formed in the collar to be discharged into the atmosphere while the press piston (8.8) moves the product towards the exit belts through the collar, and a long edge adhesive (10.3) consisting of a pneumatic piston-driven and resistance wire-heated unit when electricity is supplied.

11. The adhesive system (11) according to claim 1, characterized by comprising cold jaw pistons (11.1), an upper cold jaw (11.2), a lower cold jaw (11.3), an upper adhesive jaw (11.4) with resistance wires that heat up when electricity is supplied, a lower adhesive jaw (11.5), adhesive jaw pistons (11.6), and a cutting wire (11.7).

12. The exit belts (12) according to claim 1, characterized by comprising lower exit belt (12.1), upper exit belt (12.2), a belt operation control sensor (12.3) determining the position of the package between the exit belts (12) and sending data to the PLC processor, and belt drive motors (12.4).

13. The PLC processor according to claim 1, characterized by comprising the commands to start and stop the below parts by processing data received from sensors and entered into the control interface:

- The speed of the bunker drive motor (2.1),
- The operation and speed of the feeding belt (4) through the feed belt motor speed control drive based on data sent from the weighing unit (5) and entered from the control panel (1),
- The flap piston (5.4),
- The spiral drive motors (6.1) using electrical control elements,
- The hydraulic power unit (7),
- The compression piston (8.1) at a constant pressure and variable speeds by controlling the compression piston proportional valve (7.4),
- The front storage flap (8.6),
- The speed control drive and the press piston proportional control valve (7.2) to control the press piston (8.8) with speeds ranging from 0 to 270 liters/min with a minimum sensitivity of 10 ms,
- The packaging feeding motor (9.2),
- The cold jaw pistons (11.1),
- The adhesive jaw pistons (11.6),
- The belt drive motors (12.4).

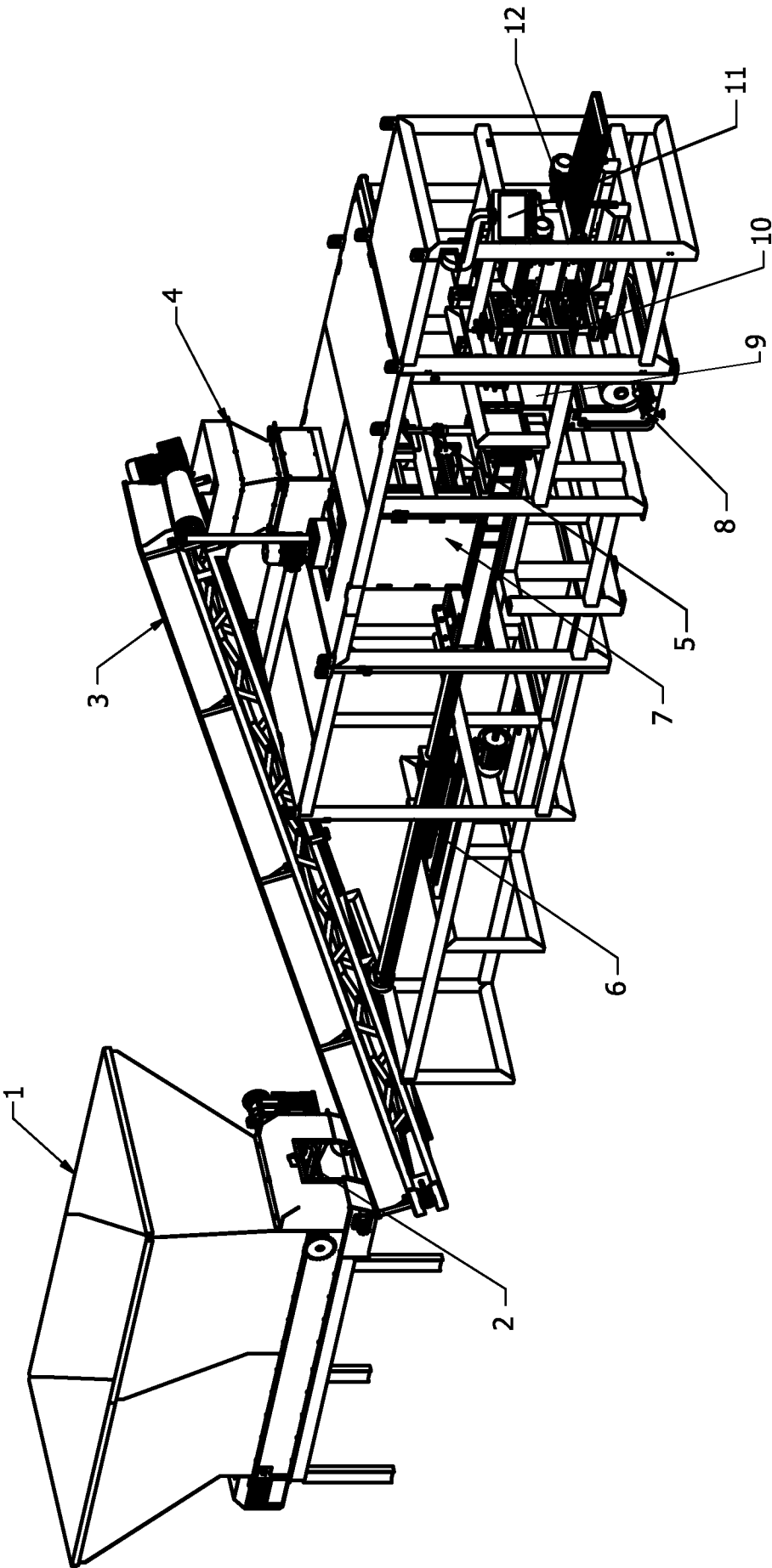


FIGURE 1

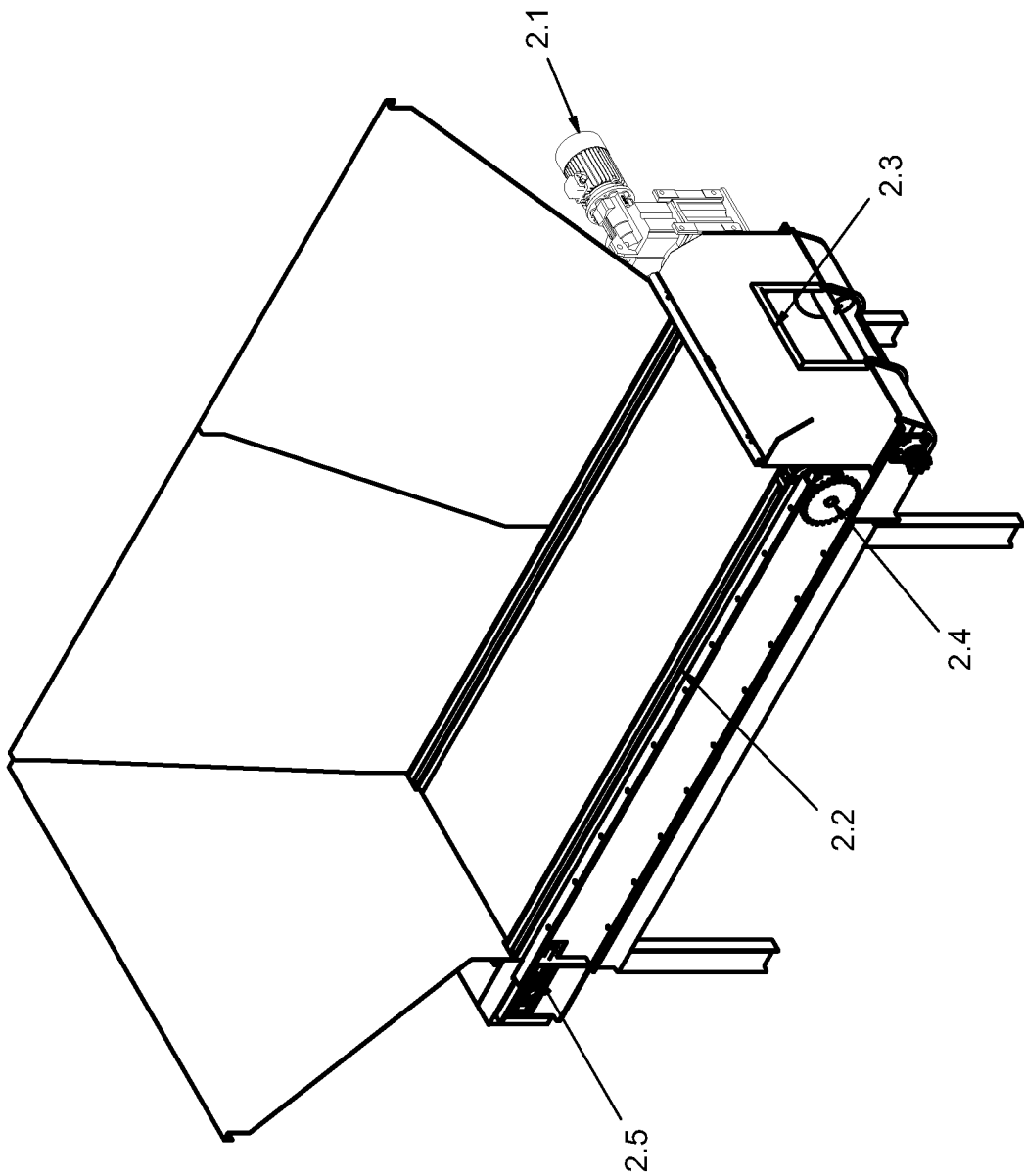


FIGURE 2

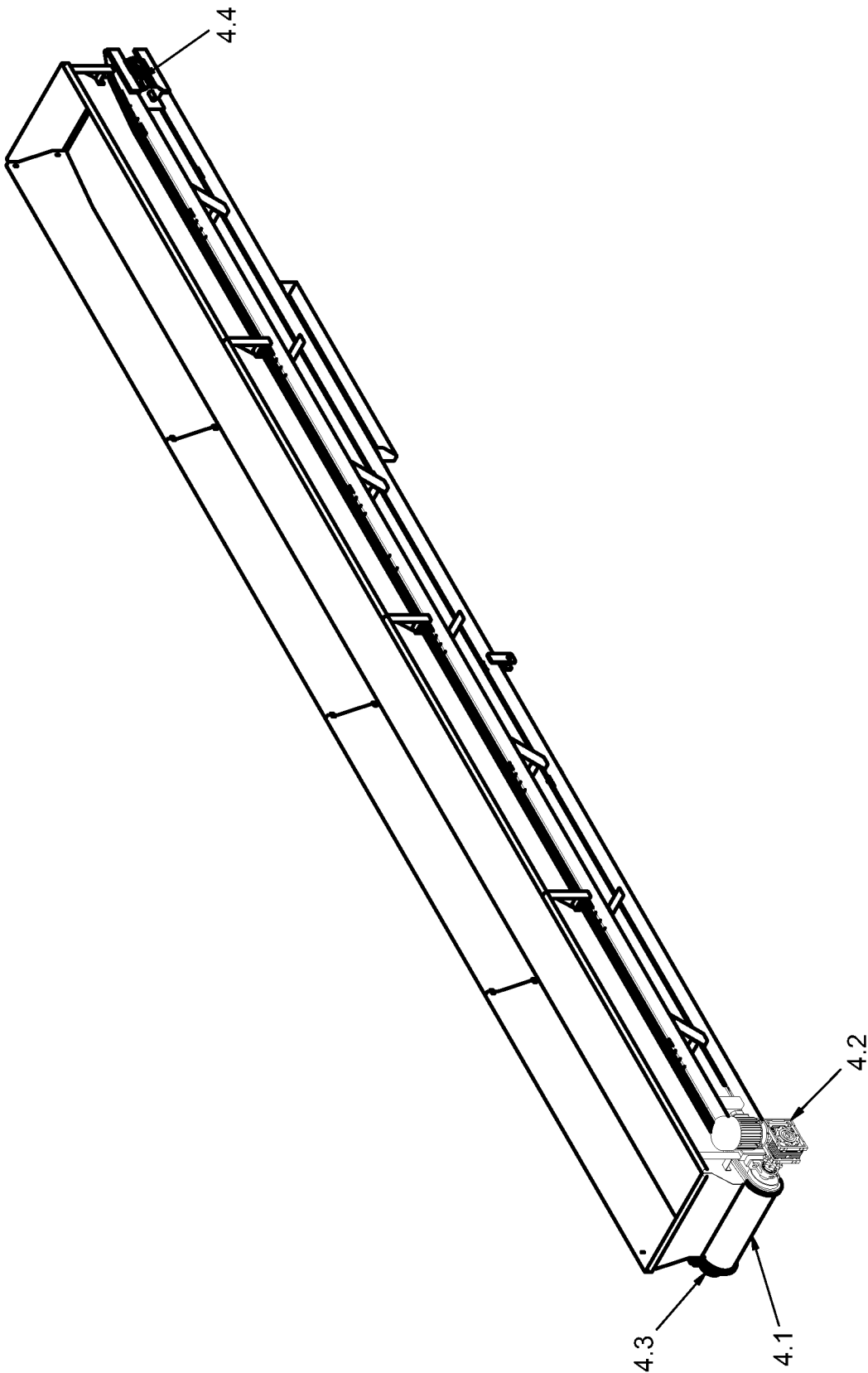


FIGURE 3

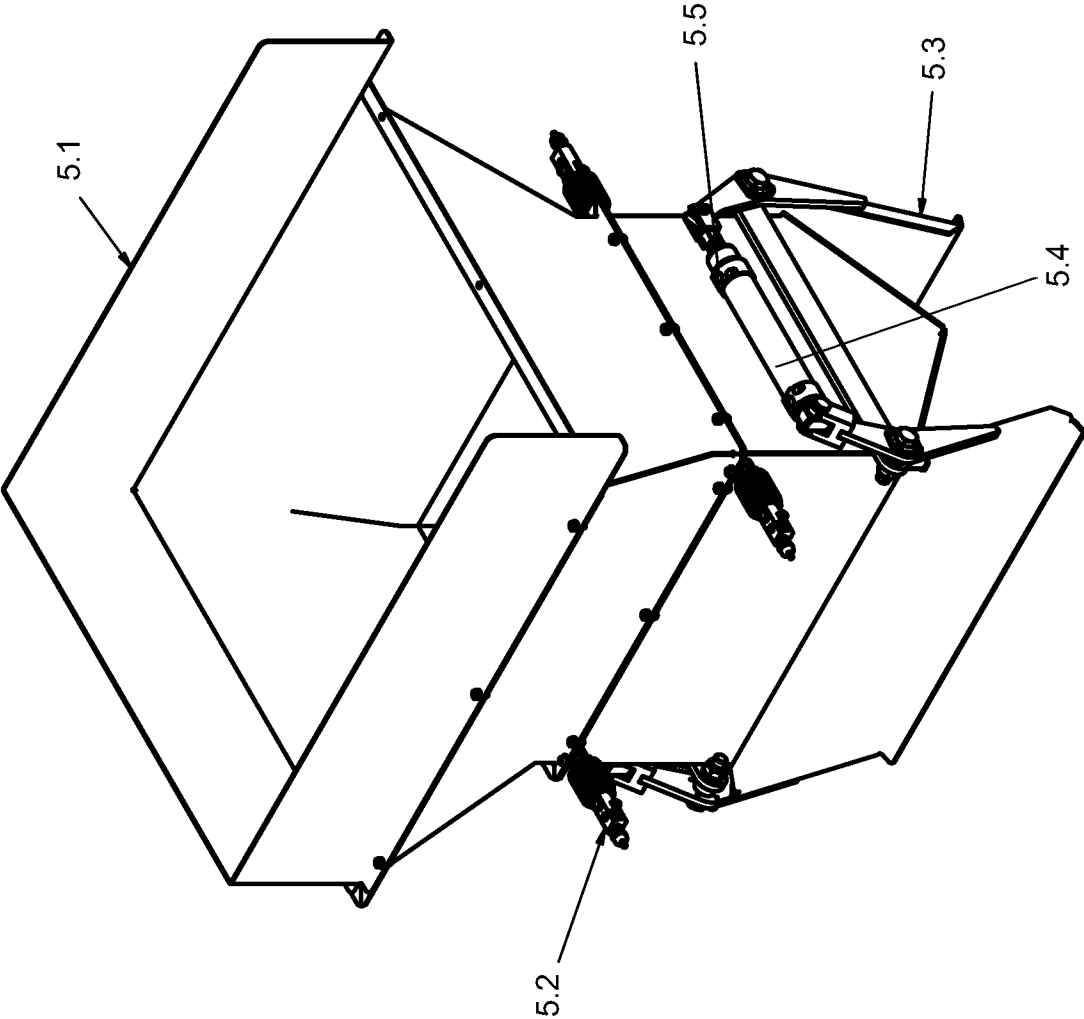


FIGURE 4

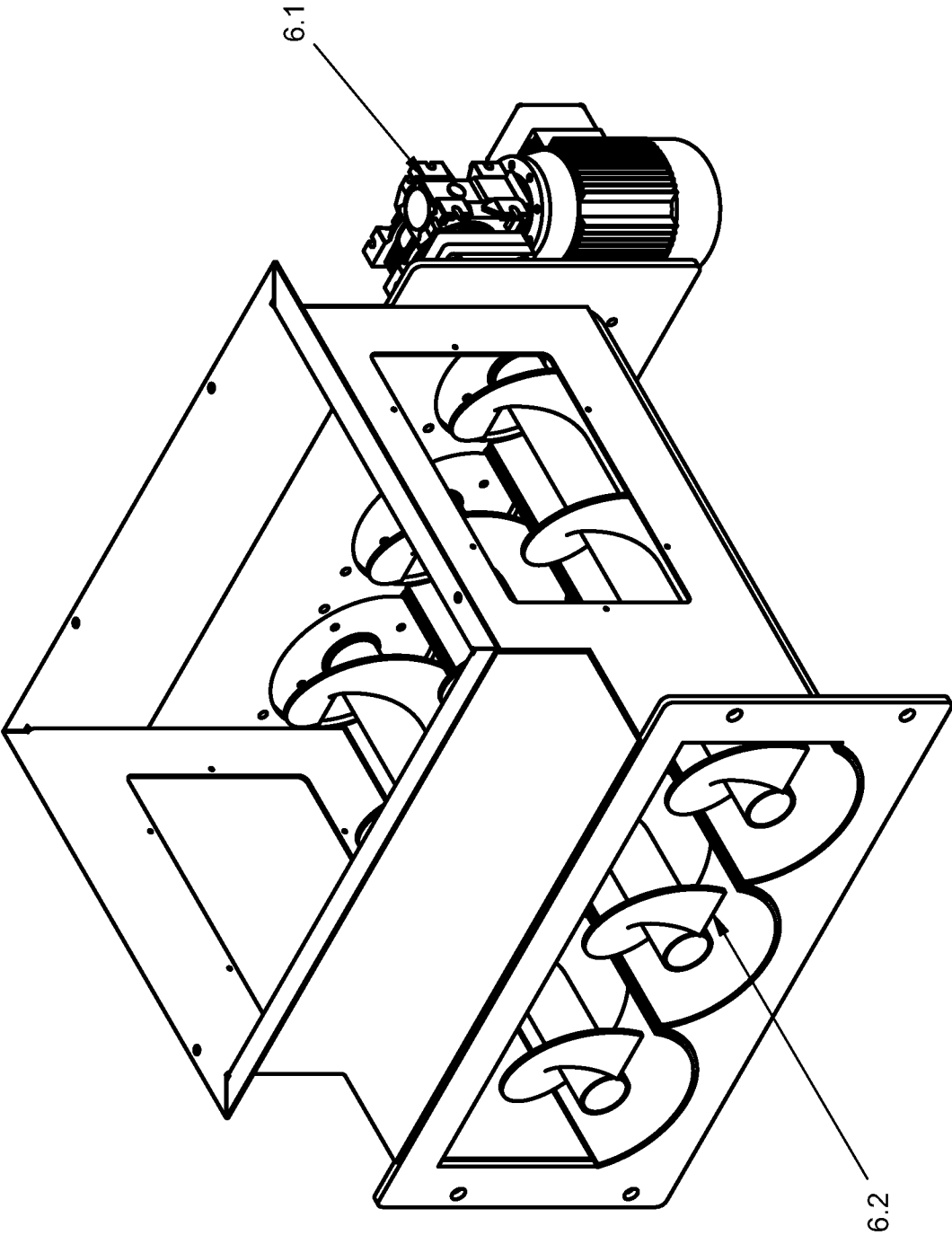


FIGURE 5

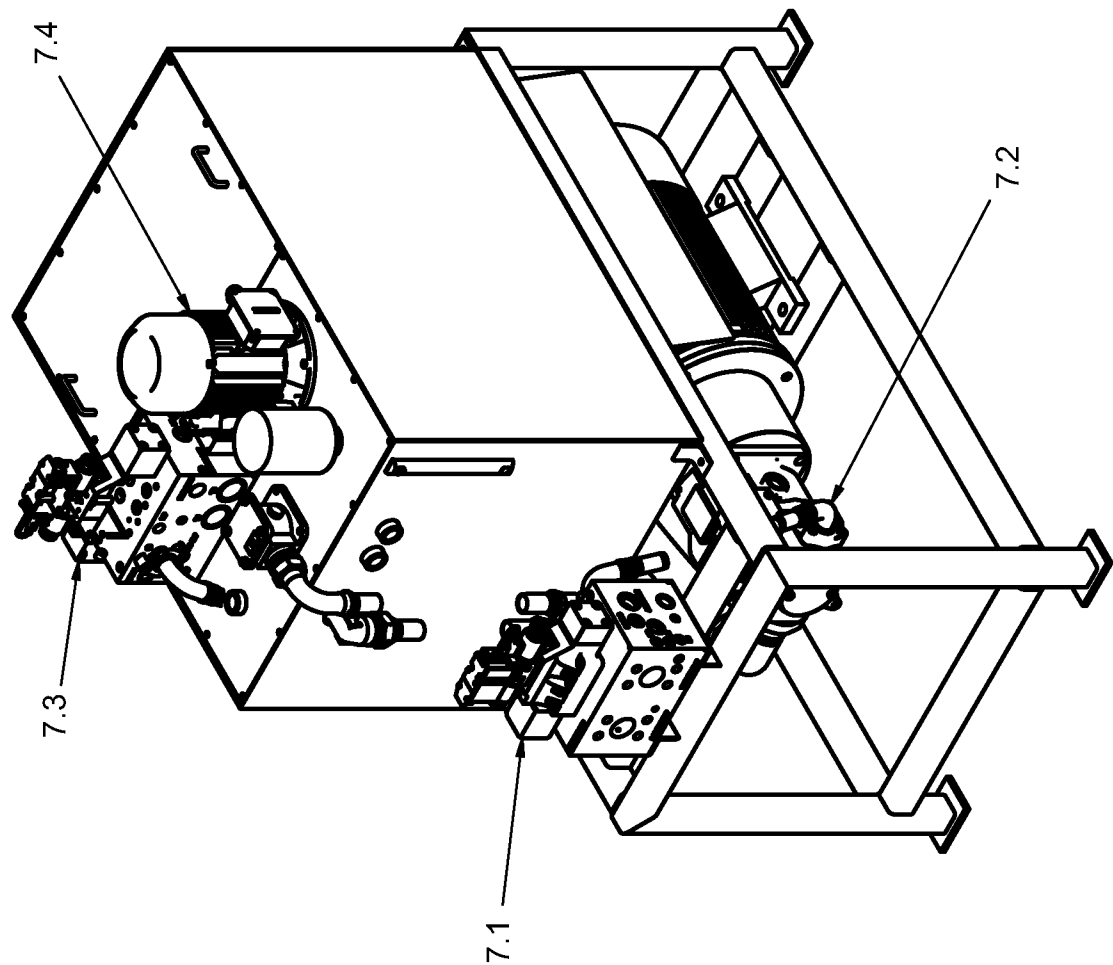


FIGURE 6

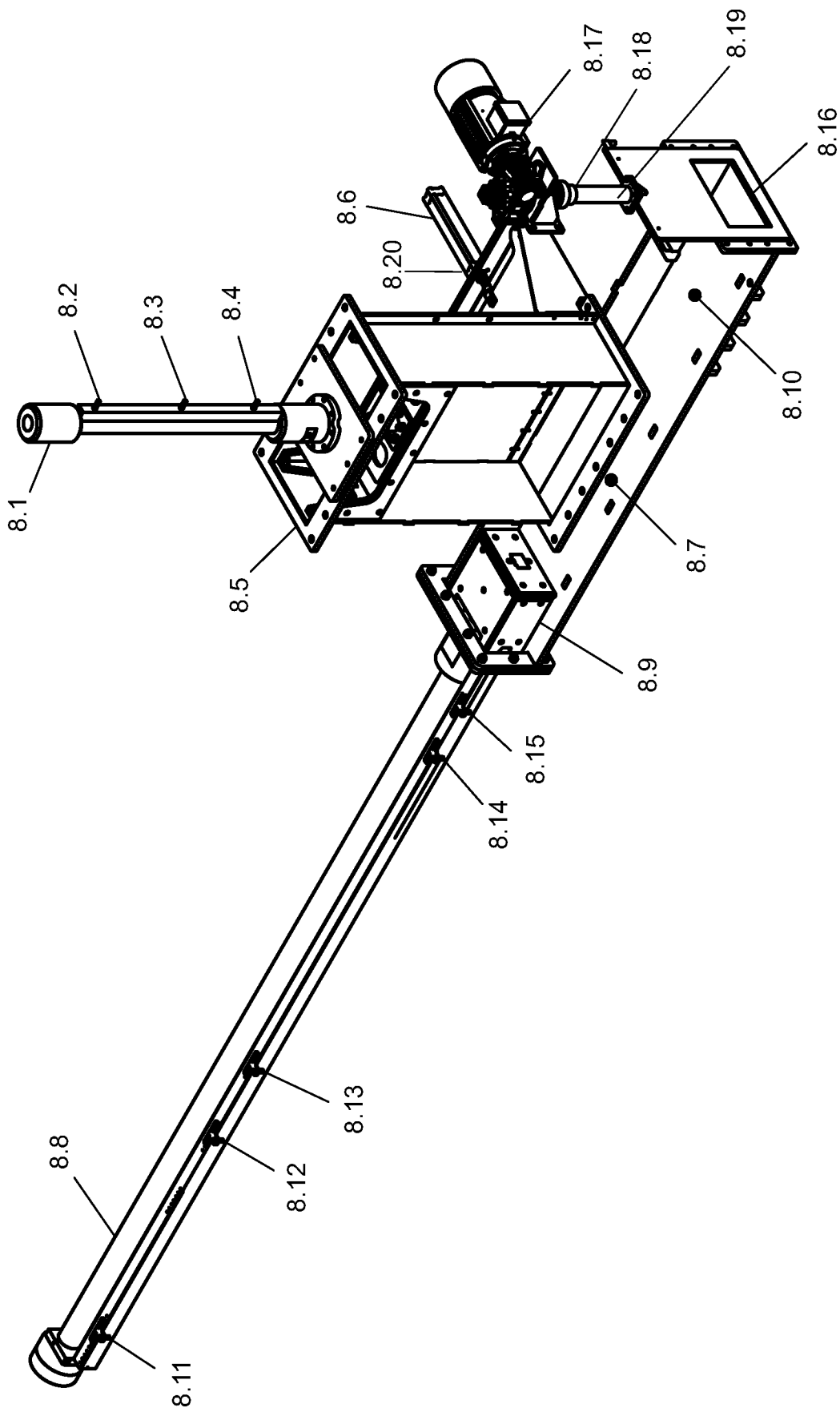


FIGURE 7

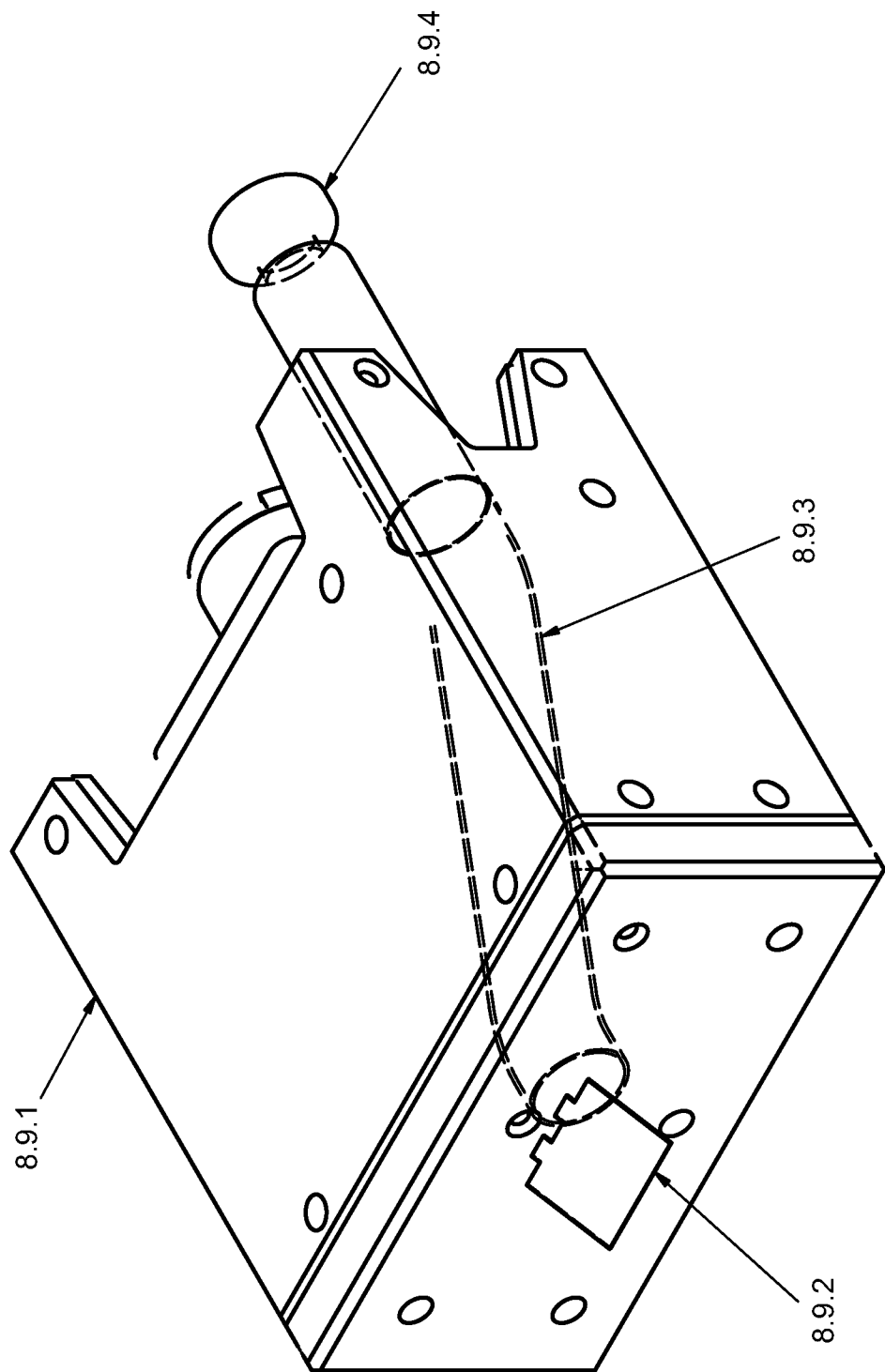


FIGURE 8

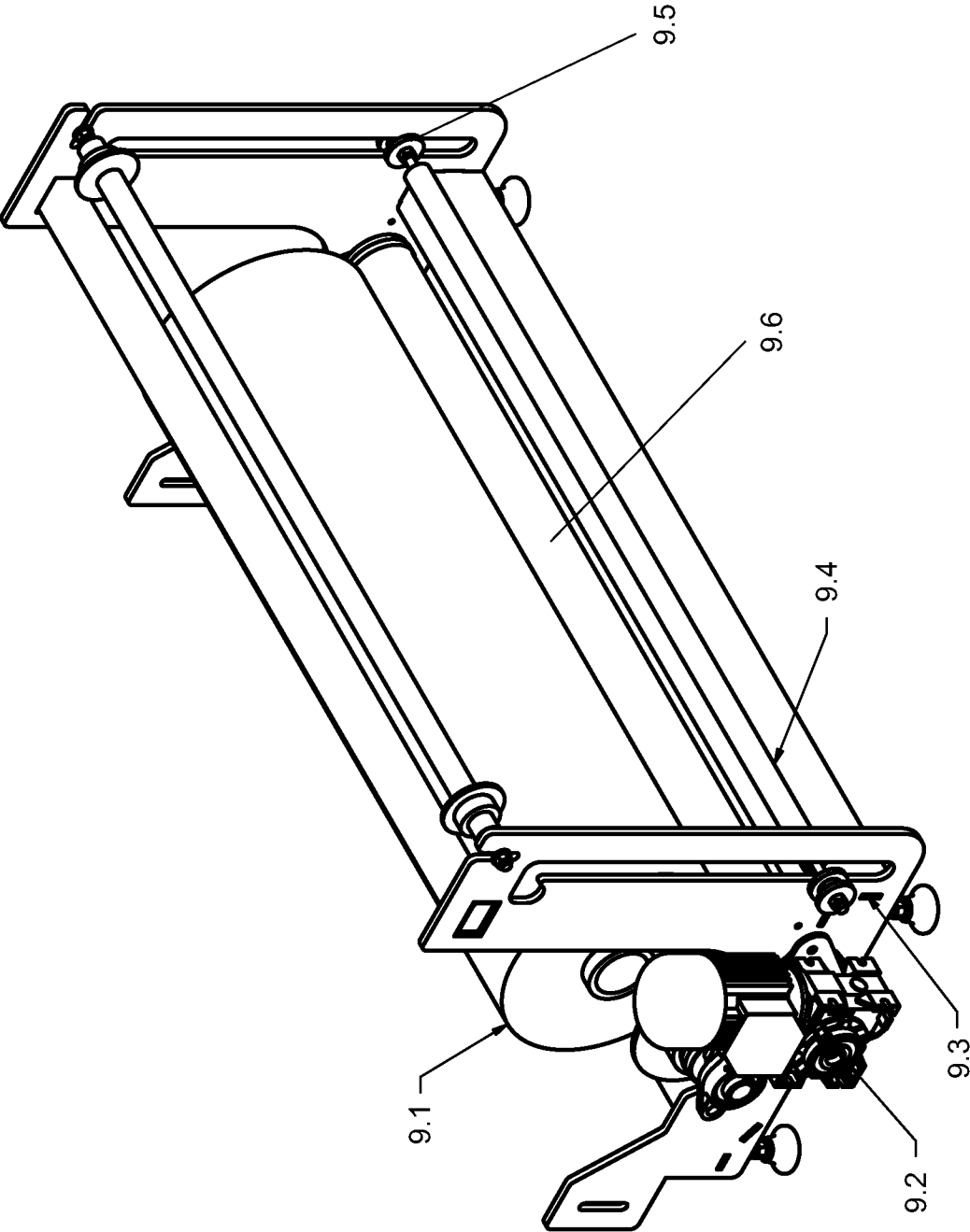


FIGURE 9

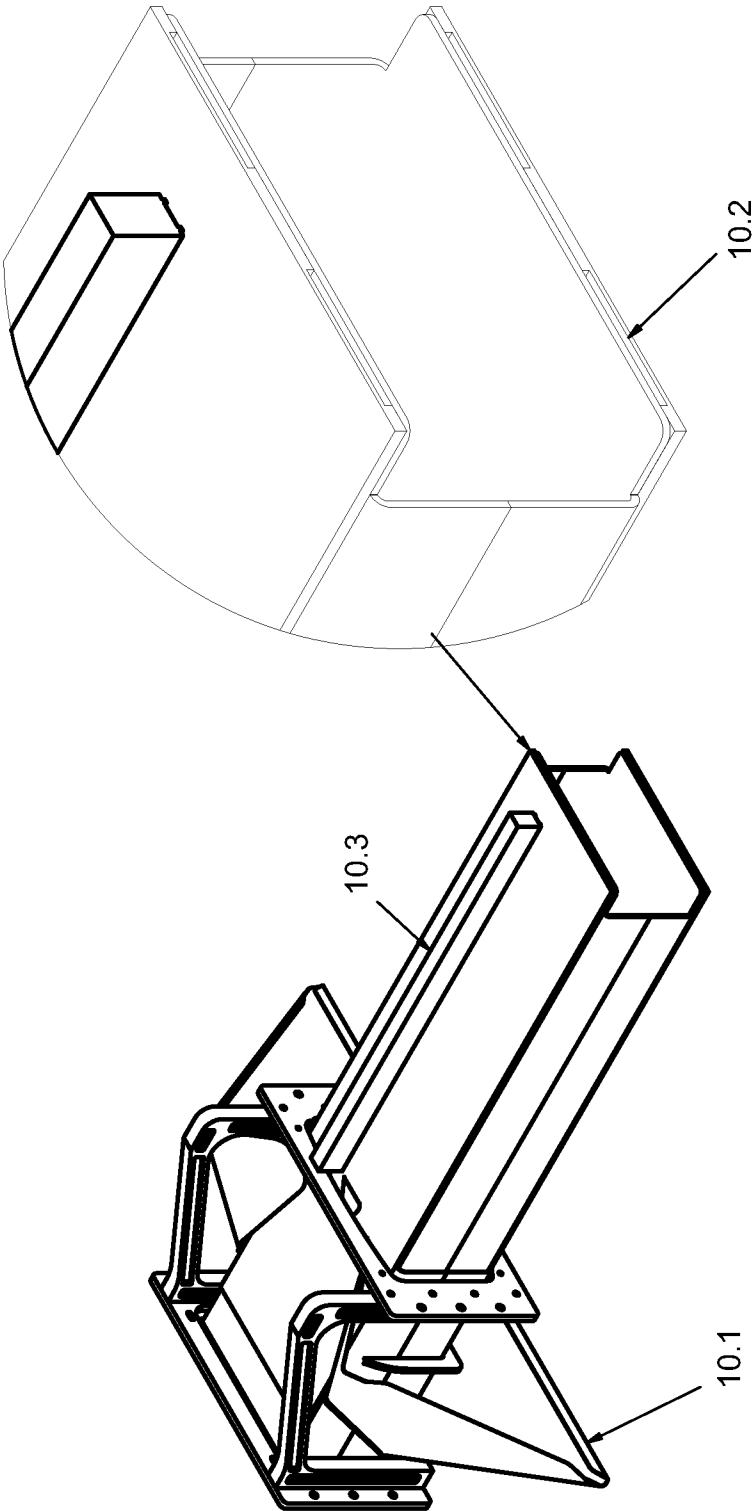


FIGURE 10

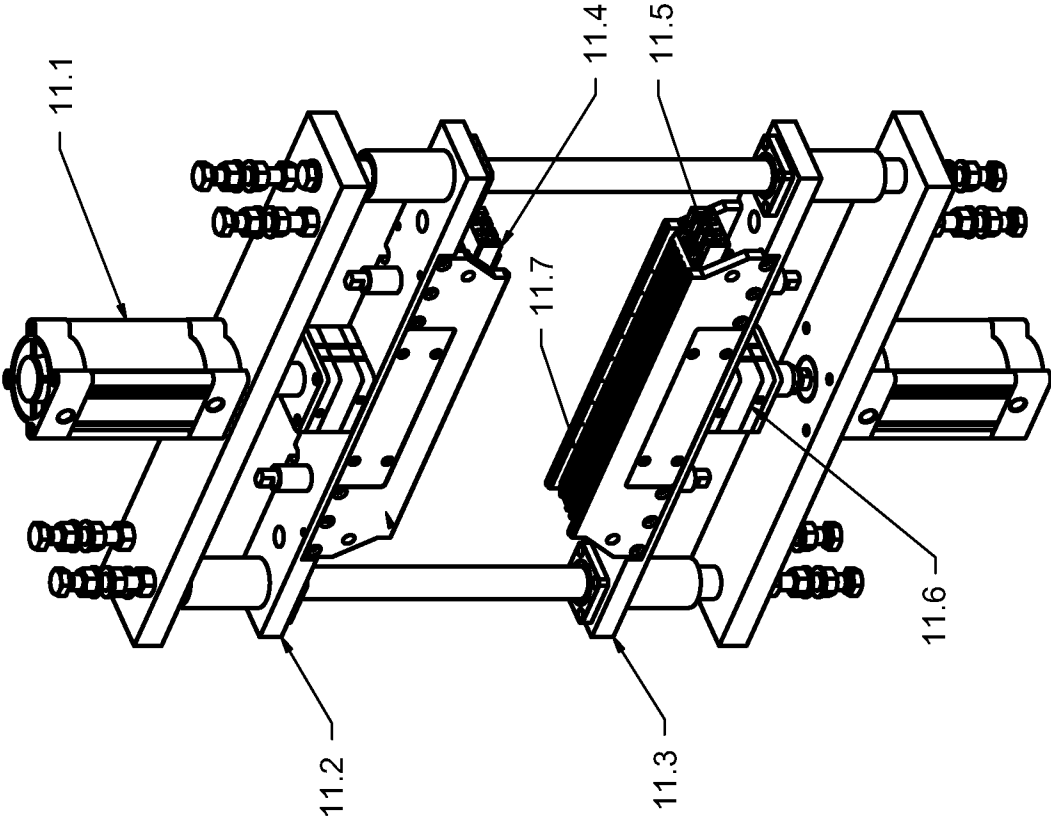


FIGURE 11

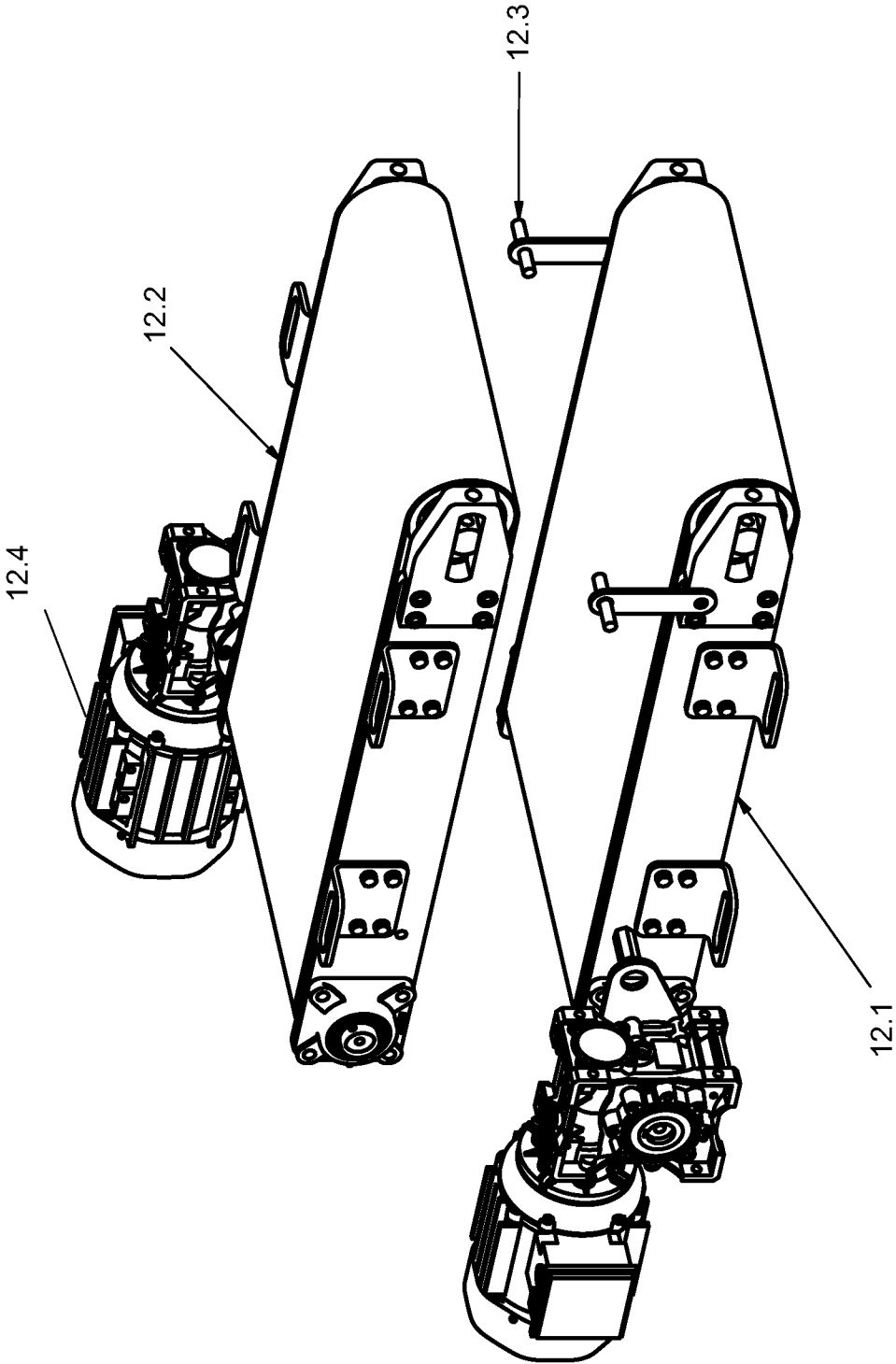


FIGURE 12

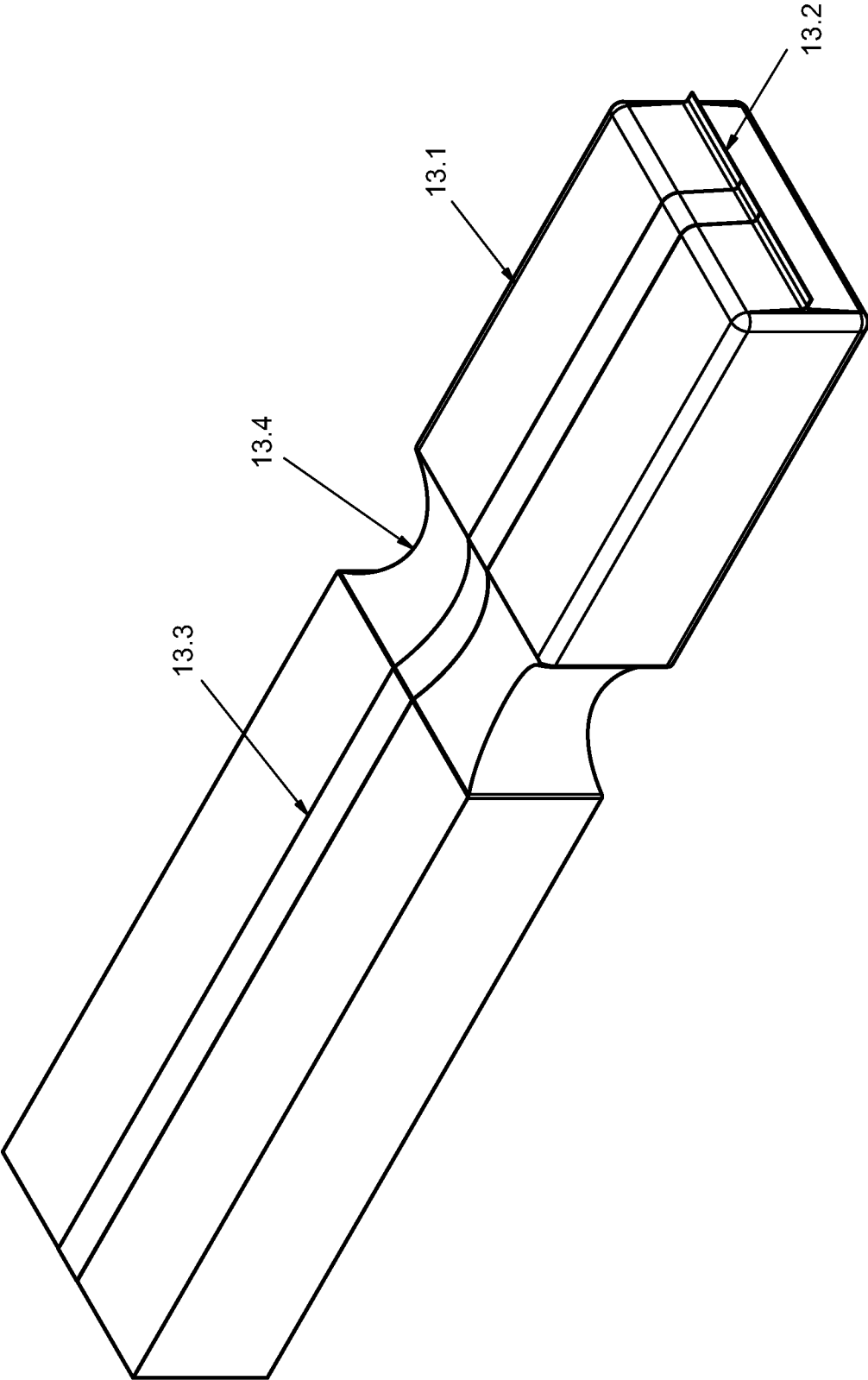


FIGURE 13

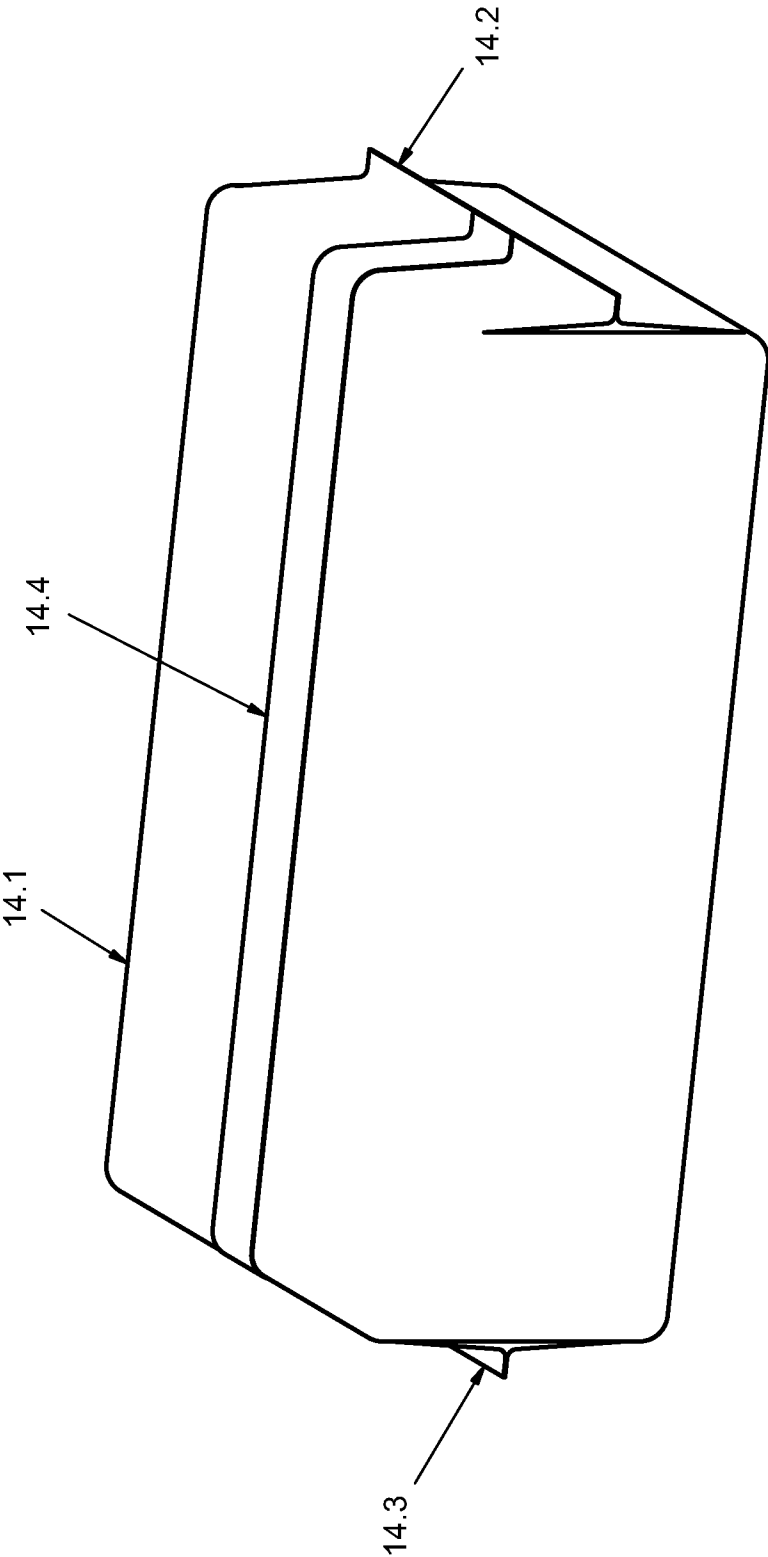


FIGURE 14

INTERNATIONAL SEARCH REPORT

International application No.

PCT/TR2023/051111

A. CLASSIFICATION OF SUBJECT MATTER**B65B 43/12**(2006.01)i; **B65B 63/02**(2006.01)i; **A01F 25/14**(2006.01)i

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; A01F

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 204688502 U (CHEN ZHENYI) 07 October 2015 (2015-10-07) page 1, line 20-25,30-45	1-13
Y	CN 214961201 U (JIN LIXIN) 03 December 2021 (2021-12-03) page 2, line 10-25	1-13
A	US 5689941 A (A C X TRADING INC [US]) 25 November 1997 (1997-11-25) Whole document	1-13
A	US 5509256 A (GROTH, ERNEST F) 23 April 1996 (1996-04-23) Whole document	1-13

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

* Special categories of cited documents:

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“O” document referring to an oral disclosure, use, exhibition or other means

“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

“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

“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

10 June 2024

Date of mailing of the international search report

10 June 2024

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/TR2023/051111

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	204688502	U	07 October 2015	NONE			
CN	214961201	U	03 December 2021	NONE			
US	5689941	A	25 November 1997	TW	364836	B	21 July 1999
				US	5736176	A	07 April 1998
US	5509256	A	23 April 1996	WO	9738907	A1	23 October 1997