

Research on Logistics Cargo Handling Robot based on Internet of Things

Jun Ma, Shuang Zhang, Zheyu Song, Mingxuan Xu, Ming Wang, Lingling Li

University of Science and Technology Liaoning, China

Abstract

The invention discloses a logistics cargo handling device based on the Internet of Things, which belongs to the technical field of Internet of Things handling devices and comprises a workbench, a loading component, a sliding component, a cargo grasping component, a rectangular handling component, a transportation component and a unloading component, wherein the workbench is horizontally arranged and provided with two sliding grooves, and the workbench is provided with a conveyor and a rectangular groove. The loading component is arranged on the workbench and is in sliding fit with the workbench through two sliding grooves, the sliding component is fixedly arranged on the top of the workbench, the catching component is arranged on the sliding component and is in sliding fit with the sliding component, the rectangular carrying component is arranged beside the conveyor and is in rotating fit with the workbench, and the transporting component is obliquely arranged at the rear end of the workbench. The unloading component is fixedly connected to the workbench. In this design, the goods grabbing component can realize the automatic grabbing of goods with the sliding component, and the rectangular handling component in this design can improve the efficiency of automatic unloading.

Keywords

Internet of Things; Logistics; Cargo Handling; Robot.

1. Introduction

With the development trend of intelligent manufacturing, scenes such as factory/logistics warehouse are becoming more and more intelligent, and the demand for automation is imminent. At present, most factories/warehouses still use conveyor belts and manual sorting and palletizing to work, with low working efficiency and high error rate. Some factories use expensive multi-degree-of-freedom fixed mechanical arm or RGV(Rail Guided Vehicle), Rail-guided vehicles (also called rail shuttle cars) realize sorting. The cost is too high, it is difficult to popularize, and it has great limitations, which limits the development of flexible production. At present, the solutions for small-scale material handling in factories or warehouses are relatively simple, with few related products, and the existing products are expensive and not adaptable, so we need a low-priced one. And can replace the logistics robot of manual palletizing and handling to fill this vacancy in the market.

2. Design Content

This design embodiment provides a logistics cargo handling device based on the Internet of Things, which aims to solve the technical problems that the cargo can not be automatically grabbed, the efficiency of cargo transportation can not be effectively improved, and the multi-directional and multi-angle automatic blanking operation can not be carried out.

The design embodiment adopts the following technical scheme: it comprises a workbench, a loading component, a sliding component, a cargo grasping component, a rectangular transporting component, a transporting component and a unloading component, wherein the workbench is horizontally placed and provided with two sliding grooves, and the workbench is provided with a conveyor and a rectangular groove. The loading assembly is arranged on the workbench and is in sliding fit with the workbench through two sliding grooves, the sliding assembly is fixedly arranged at the top of the workbench, the cargo grasping assembly is arranged on the sliding assembly and is in sliding fit with the sliding assembly, the rectangular carrying assembly is arranged beside the conveyor and is in rotating fit with the workbench, and the transporting assembly is obliquely arranged at the rear end of the workbench. The unloading component is fixedly connected to the workbench.

The loading assembly comprises a sliding plate, a loading box, two moving motors, two sliding gears and two sliding racks, wherein the sliding plate is horizontally arranged on the workbench and is in sliding fit with the workbench through two sliding grooves, the loading box is fixedly connected to the sliding plate, and the two moving motors are symmetrically arranged on the sliding plate. Two sliding racks are symmetrically arranged outside the two sliding grooves and fixedly connected with the workbench, each sliding gear is arranged on the main shaft of the mobile motor and is in transmission connection with the main shaft of the mobile motor, and the sliding gear and the sliding racks are meshed with each other.

The sliding assembly comprises a mounting bracket, a sliding motor, a threaded rod and a sliding block, wherein the mounting bracket is horizontally arranged at the top of the workbench and provided with a chute; the sliding motor is fixedly connected to the side wall of the mounting bracket; the threaded rod is rotatably connected to the mounting bracket; and the top end of the threaded rod is arranged on the main shaft of the sliding motor and is in transmission connection with the main shaft of the sliding motor. The sliding block is threadedly connected to the threaded rod and is in sliding fit with the mounting frame through the chute.

The cargo grasping assembly comprises a lifting part and a grasping part, wherein the lifting part is arranged on and rotatably connected with the sliding block, and the grasping part is arranged on the lifting end of the lifting part and slidably matched with the lifting part.

The lifting component comprises a first belt, four rotating wheels, four first rotating shafts and four lifting motors, wherein the four first rotating shafts are rotatably connected to the sliding block, the four rotating wheels are fixedly connected to one end of the four first rotating shafts, and the four lifting motors are fixedly connected to the side wall of the sliding block. Each first rotating shaft is arranged on the main shaft of the lifting motor and is in transmission connection with the main shaft of the lifting motor, and the first belt is sleeved on four rotating wheels.

The grabbing component comprises a first lifting plate, a second lifting plate, two second rotating shafts, two third rotating shafts, two fourth rotating shafts, two grabbing hands and four rotating plates, one end of the first belt is arranged on the first lifting plate and fixedly connected with the first lifting plate, The other end of the first belt penetrates through the first lifting plate and is arranged on the second lifting plate and is fixedly connected with the second lifting plate; two second rotating shafts are symmetrically arranged on the first lifting plate; two third rotating shafts are symmetrically arranged on the second lifting plate; the top ends of two grasping hands are rotationally connected with the third rotating shafts; and two fourth rotating shafts are rotationally connected with two grasping hands respectively. One end of each rotating plate is rotatably connected to both ends of two second rotating shafts, and the other end of each rotating plate is rotatably connected to both ends of two fourth rotating shafts.

The rectangular handling assembly comprises a rotating motor, a rectangular plate, a sliding frame, a screening frame, a rotating plate, two sliding sleeves and two limit plates, wherein the

rotating motor is fixedly connected to the bottom of the workbench and the main shaft of the rotating motor is rotationally matched with the workbench; the rectangular plate is arranged in the rectangular groove; and the two limit plates are symmetrically arranged on both sides of the rectangular groove and fixedly connected with the workbench. Each sliding sleeve is arranged on the limiting plate and is in sliding fit with the limiting plate; one end of the rotating plate is arranged on and in transmission connection with the main shaft of the rotating motor; the rotating plate rotates on the rectangular plate; two ends of the sliding frame are fixedly connected to the side walls of the two sliding sleeves; the screening frame is arranged on the two sliding sleeves and is in sliding fit with the two sliding sleeves; The bottom of the screening frame is provided with a cylindrical rod which runs through the sliding frame, and the other end of the rotating plate is fixedly connected with the cylindrical rod.

The transportation assembly comprises a transportation frame, a plurality of rotating rods and a plurality of rotating rollers, wherein the transportation frame is obliquely arranged at the rear end of the workbench; a plurality of rotating rods are rotationally connected to the transportation frame at equal intervals; and each rotating roller is fixedly connected to the rotating rod.

The blanking assembly comprises a rotating motor, a fifth rotating shaft, a rotating gear, a rotating toothed plate, a mounting plate, a blanking motor, a first pulley, a second pulley, a second belt, a sixth rotating shaft, a seventh rotating shaft, a blanking plate, two limit seats, two lifting gears, two lifting racks and two cylindrical barrels. The rotary motor is arranged at the bottom of the workbench, and the main shaft of the rotary motor is rotationally matched with the workbench; the bottom end of the fifth rotary shaft is rotationally connected to the workbench; the rotary gear is drivingly connected to the main shaft of the rotary motor; the rotary toothed disk is fixedly connected to the fifth rotary shaft; the rotary gear and the rotary toothed disk are meshed with each other; and the mounting plate is arranged on the rotary toothed disk. Two limiting seats are symmetrically arranged on the top of the mounting plate, the blanking motor is arranged on the mounting plate, the sixth and seventh rotating shafts penetrate through the two limiting seats and are rotationally matched with the two limiting seats, the first pulley is arranged on the main shaft of the blanking motor, the second pulley is arranged at one end of the seventh rotating shaft, and the second belt is sleeved on the first pulley and the second pulley. Two lifting gears are respectively arranged at the other ends of the sixth rotating shaft and the seventh rotating shaft, two cylindrical barrels are symmetrically arranged at the top of the mounting plate, grooves for the two lifting gears to rotate are respectively arranged on the two cylindrical barrels, two lifting racks are sleeved in the two cylindrical barrels and are in sliding fit with the cylindrical barrels, and the two lifting gears are respectively meshed with the two lifting racks. The blanking plate is fixedly connected to the top ends of the two lifting racks.

3. The Implementation Mode

Referring to Figure 1, this design embodiment provides a logistics cargo handling device based on the Internet of Things, which includes a workbench, a loading assembly, a sliding assembly, a cargo grasping assembly, a rectangular handling assembly, a transportation assembly and a unloading assembly. The workbench is horizontally placed and provided with two sliding grooves, and the workbench is provided with a conveyor and a rectangular groove. The loading assembly is arranged on the workbench and is in sliding fit with the workbench through two sliding grooves, the sliding assembly is fixedly arranged at the top of the workbench, the cargo grasping assembly is arranged on the sliding assembly and is in sliding fit with the sliding assembly, the rectangular carrying assembly is arranged beside the conveyor and is in rotating

fit with the workbench, and the transporting assembly is obliquely arranged at the rear end of the workbench. The unloading component is fixedly connected to the workbench.

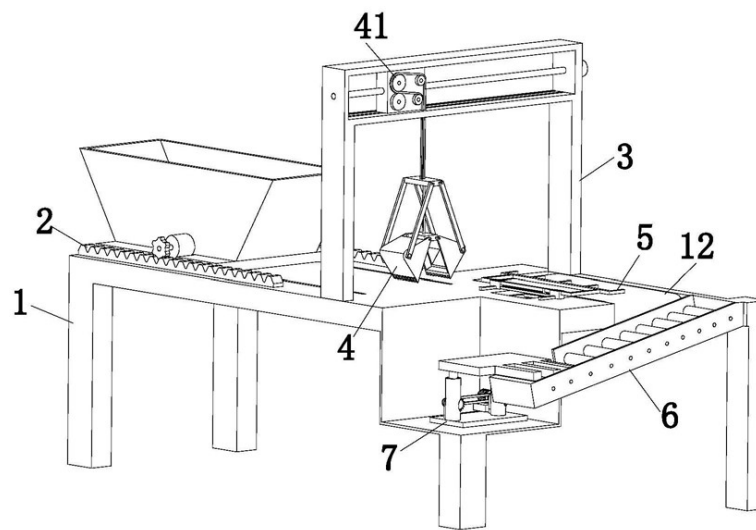


Figure 1. is the structural diagram of this design.

The loading assembly comprises a sliding plate, a loading box, two moving motors, two sliding gears and two sliding racks, wherein the sliding plate is horizontally arranged on the workbench and is in sliding fit with the workbench through two sliding grooves, the loading box is fixedly connected to the sliding plate, and the two moving motors are symmetrically arranged on the sliding plate. Two sliding racks are symmetrically arranged outside the two sliding grooves and fixedly connected with the workbench, each sliding gear is arranged on the main shaft of the mobile motor and is in transmission connection with the main shaft of the mobile motor, and the sliding gear and the sliding racks are meshed with each other.

When the goods need to be transported, the goods are loaded in the loading box, and the two moving motors work to drive the two sliding gears to rotate on the two sliding racks engaged with them, so as to drive the sliding plate to move forward and move the goods in the loading box to the next working range, so that the goods can be transported.

The sliding assembly comprises a mounting bracket, a sliding motor, a threaded rod and a sliding block, wherein the mounting bracket is horizontally arranged at the top of the workbench, the mounting bracket is provided with a chute, the sliding motor is fixedly connected to the side wall of the mounting bracket, the threaded rod is rotatably connected to the mounting bracket, and the top end of the threaded rod is arranged on the main shaft of the sliding motor and is in transmission connection with the main shaft of the sliding motor. The sliding block is threadedly connected to the threaded rod and is in sliding fit with the mounting frame through the chute.

When carry operation is needed, that slide motor works to drive the threaded rod to rotate on the mounting frame, and the rotation of the thread rod drives the sliding block connected with the threaded rod to slide on the mounting frame through the chute, thereby driving the cargo grasping assembly to grasp and place the goods.

The cargo grasping assembly comprises a lifting part and a grasping part, wherein the lifting part is arranged on and rotatably connected with the sliding block, and the grasping part is arranged on the lifting end of the lifting part and slidably matched with the lifting part; When it is necessary to grab goods, when the lifting part works to drive the grabbing part to descend into the loading box, the grabbing part works to grab the goods in the loading box. Subsequently, the lifting component works to drive the grabbing component to rise and slide on the mounting

frame through the sliding block, and the grabbed goods are placed on the conveyor to realize the grabbing operation.

The lifting component comprises a first belt, four rotating wheels, four first rotating shafts and four lifting motors, wherein the four first rotating shafts are rotatably connected to the sliding block, the four rotating wheels are fixedly connected to one end of the four first rotating shafts, and the four lifting motors are fixedly connected to the side wall of the sliding block. Each first rotating shaft is arranged on the main shaft of the lifting motor and is in transmission connection with the main shaft of the lifting motor, and the first belt is sleeved on four rotating wheels.

When it is necessary to grab goods, the four lifting motors work to drive the four first rotating shafts to rotate on the sliding block, the rotation of the four first rotating shafts drives the rotation of the four rotating wheels, and the rotation of the four rotating wheels drives the first belt to rotate on the four rotating wheels, thus driving the grabbing part to realize lifting operation.

The grabbing component comprises a first lifting plate, a second lifting plate, two second rotating shafts, two third rotating shafts, two fourth rotating shafts, two grabbing hands and four rotating plates, one end of the first belt is arranged on the first lifting plate and fixedly connected with the first lifting plate, The other end of the first belt penetrates through the first lifting plate and is arranged on the second lifting plate and is fixedly connected with the second lifting plate; two second rotating shafts are symmetrically arranged on the first lifting plate; two third rotating shafts are symmetrically arranged on the second lifting plate; the top ends of two grasping hands are rotationally connected with the third rotating shafts; and two fourth rotating shafts are rotationally connected with two grasping hands respectively. One end of each rotating plate is rotatably connected to both ends of two second rotating shafts, and the other end of each rotating plate is rotatably connected to both ends of two fourth rotating shafts.

When grabbing goods, the four lifting motors on the sliding block rotate forward to drive the four first rotating shafts to rotate, the four first rotating shafts rotate to drive the four rotating wheels to rotate, and the four rotating wheels rotate to drive the first belt to rotate. At this time, the first lifting plate and the second lifting plate fixedly connected with both ends of the first belt move downward. The four rotating plates rotate outward on the two second rotating shafts and the two fourth rotating shafts to push the two grasping hands to open outward through the two third rotating shafts.

When the two lifting motors above the sliding block are reversed, the first belt is driven to reverse, and the second lifting plate fixedly connected with the other end of the first belt rises. At this time, the four rotating plates rotate inward on the two second rotating shafts and the two fourth rotating shafts to push the two grasping hands to approach inward through the two third rotating shafts, thus realizing the grasping operation.

The rectangular handling assembly comprises a rotating motor, a rectangular plate, a sliding frame, a screening frame, a rotating plate, two sliding sleeves and two limit plates, wherein the rotating motor is fixedly connected to the bottom of the workbench and the main shaft of the rotating motor is rotationally matched with the workbench; the rectangular plate is arranged in the rectangular groove; and the two limit plates are symmetrically arranged on both sides of the rectangular groove and fixedly connected with the workbench. Each sliding sleeve is arranged on the limiting plate and is in sliding fit with the limiting plate; one end of the rotating plate is arranged on and in transmission connection with the main shaft of the rotating motor; the rotating plate rotates on the rectangular plate; two ends of the sliding frame are fixedly connected to the side walls of the two sliding sleeves; the screening frame is arranged on the two sliding sleeves and is in sliding fit with the two sliding sleeves; The bottom of the screening

frame is provided with a cylindrical rod which runs through the sliding frame, and the other end of the rotating plate is fixedly connected with the cylindrical rod.

When transportation is needed, the rotating motor drives the rotating plate to rotate in the rectangular groove, when the rotating plate rotates to the transverse direction of the rectangular groove, it drives the sliding frame to push the two sliding sleeves to move back and forth on the two limiting plates, thus driving the screening frame to move back and forth, and when the rotating plate rotates to the longitudinal direction of the rectangular groove, it drives the screening frame to move left and right on the two sliding sleeves through the sliding frame. Therefore, the goods placed on the conveyor by the cargo grasping assembly can be repeatedly pushed forward at a certain speed, thus preventing blockage in the transportation process and improving the transportation efficiency.

The transportation assembly comprises a transportation frame, a plurality of rotating rods and a plurality of rotating rollers, wherein the transportation frame is obliquely arranged at the rear end of the workbench; a plurality of rotating rods are rotationally connected to the transportation frame at equal intervals; and each rotating roller is fixedly connected to the rotating rod.

When the goods are transported forward orderly by the rectangular transport assembly through the conveyor, the goods fall onto the transport rack and slide to the end of the transport rack through several rotating rollers, and finally, cooperate with the unloading assembly to carry out the blanking operation.

The unloading assembly comprises a rotating motor, a fifth rotating shaft, a rotating gear, a rotating toothed plate, a mounting plate, a discharging motor, a first pulley, a second pulley, a second belt, a sixth rotating shaft, a seventh rotating shaft, a discharging plate, two limit seats, two lifting gears, two lifting racks and two cylindrical barrels. The rotary motor is arranged at the bottom of the workbench, and the main shaft of the rotary motor is rotationally matched with the workbench; the bottom end of the fifth rotary shaft is rotationally connected to the workbench; the rotary gear is drivingly connected to the main shaft of the rotary motor; the rotary toothed disk is fixedly connected to the fifth rotary shaft; the rotary gear and the rotary toothed disk are meshed with each other; and the mounting plate is arranged on the rotary toothed disk. Two limiting seats are symmetrically arranged on the top of the mounting plate, the blanking motor is arranged on the mounting plate, the sixth and seventh rotating shafts penetrate through the two limiting seats and are rotationally matched with the two limiting seats, the first pulley is arranged on the main shaft of the blanking motor, the second pulley is arranged at one end of the seventh rotating shaft, and the second belt is sleeved on the first pulley and the second pulley. Two lifting gears are respectively arranged at the other ends of the sixth rotating shaft and the seventh rotating shaft, two cylindrical barrels are symmetrically arranged at the top of the mounting plate, grooves for the two lifting gears to rotate are respectively arranged on the two cylindrical barrels, two lifting racks are sleeved in the two cylindrical barrels and are in sliding fit with the cylindrical barrels, and the two lifting gears are respectively meshed with the two lifting racks. The blanking plate is fixedly connected to the top ends of the two lifting racks.

When the rotary motor works, it drives the rotary gear to rotate, the rotary gear rotates to drive the rotary toothed disk to rotate, the rotary toothed disk rotates to drive the fifth rotating shaft to rotate, thus driving the mounting plate to rotate for multi-directional and multi-angle blanking work, the blanking motor starts to work to drive the first pulley arranged on the main shaft of the blanking motor to work, and the first pulley drives the second belt to rotate. The second belt drive that second belt pulley to rotate, the first belt pulley and the second belt pulley drive the sixth rotating shaft and the seventh rotate shaft to rotate, the rotation of the sixth rotating shaft and the seventh rotating shaft drives two lif gears to rotate, and the rotation of the two lifting gears drives two lifting racks to move up and down in two cylindrical barrels. The

two lifting racks move up and down in the two cylindrical cylinders to drive the blanking plates arranged on the two lifting racks to move up and down, so as to cooperate with the transport frame for blanking operation.

4. Working Principle

When the goods need to be transported, the goods are loaded in the loading box, and the two moving motors work to drive the two sliding gears to rotate on the two sliding racks engaged with them, so as to drive the sliding plate to move forward and move the goods in the loading box to the next working range, so that the goods can be transported.

When carry operation is needed, that slide motor drives the screw rod to rotate on the mounting frame, and the rotation of the screw rod drives the slide block connected with the screw rod to slide on the mounting frame through the chute, thereby driving the cargo grasping component to grasp and place the cargo; when the cargo grasping operation is needed, the lifting component drives the grasping component to descend into the loading box, The grabbing part works to grab the goods in the loading box, then the lifting part works to drive the grabbing part to rise and slide on the mounting frame through the sliding block, and the grabbed goods are placed on the conveyor to realize the grabbing operation. Four lifting motors work to drive four first rotating shafts to rotate on the sliding block, and the four first rotating shafts rotate to drive four rotating wheels to rotate. The rotation of that four rotate wheels drive the first belt to rotate on the four rotating wheels, thereby driving the grab part to realize the lifting operation.

The forward rotation of four lifting motors on the sliding block drives four first rotating shafts to rotate, the rotation of four first rotating shafts drives four rotating wheels to rotate, and the rotation of four rotating wheels drives the first belt to rotate. At this time, the first lifting plate and the second lifting plate fixedly connected with both ends of the first belt move downward. The four rotating plates rotate outward on the two second rotating shafts and the two fourth rotating shafts to push the two grasping hands to open outward through the two third rotating shafts. When the two lifting motors above the sliding block reverse, the first belt is driven to reverse, and the second lifting plate fixedly connected with the other end of the first belt rises. At this time, the four rotating plates rotate inward on the two second rotating shafts and the two fourth rotating shafts to push the two grasping hands to approach inward through the two third rotating shafts, thus realizing the grasping operation.

When transportation is needed, the rotating motor drives the rotating plate to rotate in the rectangular groove, when the rotating plate rotates to the transverse direction of the rectangular groove, it drives the sliding frame to push the two sliding sleeves to move back and forth on the two limiting plates, thus driving the screening frame to move back and forth, and when the rotating plate rotates to the longitudinal direction of the rectangular groove, it drives the screening frame to move left and right on the two sliding sleeves through the sliding frame. Therefore, the goods placed on the conveyor by the cargo grasping assembly can be repeatedly pushed forward at a certain speed, thus preventing blockage in the transportation process and improving the transportation efficiency.

When the goods are orderly transported forward by the rectangular transport assembly through the conveyor, the goods fall onto the transport rack and slide to the end of the transport rack through a plurality of rotating rollers, and finally, cooperate with the unloading assembly to carry out blanking operation. When the rotating motor works, the rotating gear rotates, and the rotating gear rotates to drive the rotating toothed disk to rotate. The rotation of the rotating toothed disk drives the fifth rotating shaft to rotate, thus driving the mounting plate to rotate for multi-directional and multi-angle blanking work, the blanking motor starts to work to drive the first pulley arranged on the main shaft of the blanking motor to work, the first pulley drives

the second belt to rotate, and the second belt drives the second pulley to rotate. The first belt pulley and the second belt pulley drive the sixth rotating shaft and the seventh rotating shaft to rotate, the rotation of the sixth rotating shaft and the seventh rotating shaft drives two lifting gears to rotate, and the rotation of the two lifting gears drives two lifting racks to move up and down in the two cylindrical barrels. The two lifting racks move up and down in the two cylindrical cylinders to drive the blanking plates arranged on the two lifting racks to move up and down, so as to cooperate with the transport frame for blanking operation.

5. Design Features

Firstly, when carry operation is needed, that slide motor work to drive the threaded rod to rotate on the mounting frame, the rotation of the threaded rod drive the sliding block connected with the threaded rod to slide on the mounting frame through the sliding groove, thereby driving the cargo grabbing assembly to grab and place the cargo, and the four lifting motors work to drive four first rotating shafts to rotate on the sliding block, The rotation of the four first rotating shafts drives the four rotating wheels to rotate, and the rotation of the four rotating wheels drives the first belt to rotate on the four rotating wheels, thus driving the grasping part to realize the lifting operation; the forward rotation of the four lifting motors on the sliding block drives the four first rotating shafts to rotate, and the rotation of the four first rotating shafts drives the four rotating wheels to rotate. The rotation of that four rotate wheels drive the first belt to rotate, at this time, the first lif plate and the second lifting plate, which are fixedly connected with both ends of the first belt, move downward, and the four rotating plates rotate outwards on the two second rotating shafts and the two fourth rotating shafts to push the two grasping hands to open outwards through the two third rotating shafts; when the two lifting motors above the sliding block are reversed, The first belt is driven to turn over, and the second lifting plate fixedly connected with the other end of the first belt rises. At this time, the four rotating plates rotate inward on the two second rotating shafts and the two fourth rotating shafts to push the two grasping hands to approach inward through the two third rotating shafts, thereby realizing the grasping operation.

Secondly, when carrying work is needed, the rotating motor drives the rotating plate to rotate in the rectangular groove, when the rotating plate rotates to the transverse direction of the rectangular groove, it drives the sliding frame to push the two sliding sleeves to move back and forth on the two limiting plates, never drives the screening frame to move back and forth, and when the rotating plate rotates to the longitudinal direction of the rectangular groove, it drives the screening frame to move left and right on the two sliding sleeves through the sliding frame. Therefore, the goods placed on the conveyor by the cargo grasping assembly can be repeatedly pushed forward at a certain speed, thus preventing blockage in the transportation process and improving the transportation efficiency.

Thirdly, when the rotary motor works, it drives the rotary gear to rotate, the rotary gear rotates to drive the rotary toothed disk to rotate, and the rotary toothed disk rotates to drive the fifth rotating shaft to rotate, thus driving the mounting plate to rotate for multi-directional and multi-angle blanking work, and the blanking motor starts to work to drive the first pulley arranged on the main shaft of the blanking motor to work. The first belt pulley drives the second belt to rotate, the second belt pulley drives the second belt pulley to rotate, the first belt pulley and the second belt pulley drive the sixth rotating shaft and the seventh rotating shaft to rotate, the rotation of the sixth rotating shaft and the seventh rotating shaft drives two lifting gears to rotate, and the rotation of the two lifting gears drives two lifting racks to move up and down in the two cylindrical cylinders. The two lifting racks move up and down in the two cylindrical cylinders to drive the blanking plates arranged on the two lifting racks to move up and down, so as to cooperate with the transport frame for blanking operation.

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