

Design of Automatic Express Delivery Equipment

Zhaoyang Wu

School of logistics engineering, Shanghai Maritime University, Shanghai 201306, China.

Abstract

Fully automatic express delivery equipment, involving the technical field of express delivery equipment, including AGV trolley, pneumatic drive system, robotic arm gripper system and express cabinet system. The robotic arm gripper system includes motor one, mounting plate, rotating support, and motor two, Big arm, motor three, cylinder type middle arm, motor four, double piston pneumatic cylinder and mechanical gripper, motor one is connected to the rotating support, motor two is connected to the big arm, motor three is connected to the cylinder type middle arm, motor four The output shaft is connected with a double-piston pneumatic cylinder. The express cabinet system includes a frame and multiple express cabinets. The express cabinet includes a cabinet body, a cabinet door and a holding electromagnetic lock. The frame is equipped with a computer central control system. The device mounts the robotic arm gripper system on the AGV trolley. The robotic arm gripper system has the ability to move freely in multiple directions. It grabs express delivery and puts it in the express cabinet, and scans the express bar code through the scan code sensor to send pickup information to the user to achieve express delivery. Delivery is fully automated.

Keywords

Express Delivery; Fully Automatic; Express Delivery Industry.

1. Introduction

As the logistics and transportation industry develops more and more in the direction of automation and intelligence, express cabinets are placed in the community, and logistics personnel put the express in the express cabinet, and shoppers go to the express cabinet to pick up according to the pickup code, which solves the problem for shoppers. Express delivery issues when not at home,

However, after express delivery to the express service center, although smart code scanning has been realized, it still needs to manually place the express into the corresponding express cabinet. This process requires a lot of manpower and time cost, so it has become a fully automated express The "last mile" of this equipment is a fully automatic express delivery device, which improves the efficiency of express delivery in the express service center and realizes the intelligent and fully automated delivery of express delivery. Fig 1 and Fig 2 are the express transportation trolley system and express cabinet system respectively.

2. Overall equipment design

As shown in Fig. 1 and Fig. 2, the fully automatic express delivery equipment includes AGV trolley 1, pneumatic drive system (not shown in the figure), robotic arm gripper system 2 and express cabinet system 3, and the upper surface of AGV trolley 1 A bracket 11 is arranged vertically at one end, and the bracket 11 is a box-shaped structure with an open upper end. The pneumatic transmission system is arranged in the bracket 11, and the upper surface of the AGV trolley 1 is provided with a courier basket 12, which is used to store the storage For the express in the express cabinet 32, a 3D vision sensor 13 is installed on the upper end of the express basket 12, and the 3D vision sensor 13 faces the

express basket 12, which is used to locate the position of the express, so that the robotic arm gripper system 2 can accurately grasp the express basket 12. In the express delivery, the AGV trolley 1 uses the conventional AGV trolley on the market, and the 3D vision sensor 13 uses the conventional vision sensor on the market.

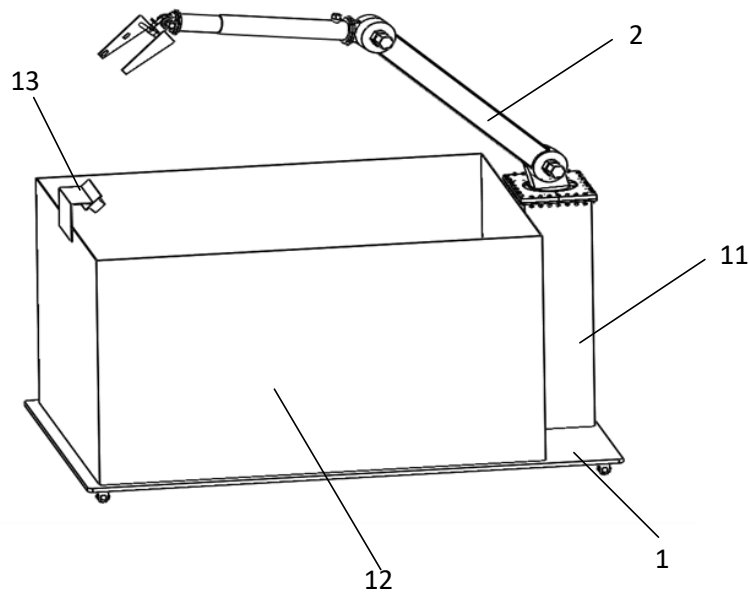


Fig. 1 Express delivery transportation trolley system

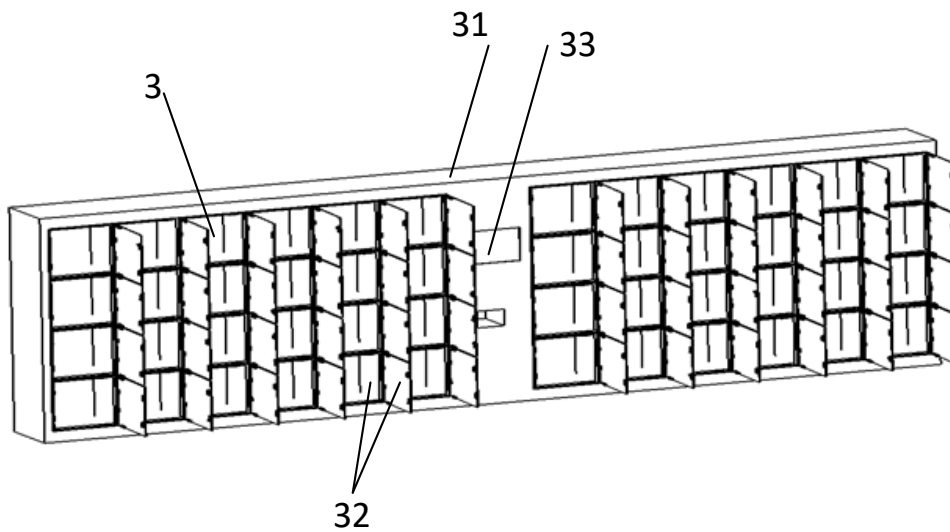


Fig. 2 Express cabinet system

3. Design of robotic arm gripper system

The robotic arm gripper system 2 includes a motor one 21, a mounting plate 22, a rotating support 23, a motor two 24, a large arm 25, a motor three 26, a cylinder type middle arm 27, a motor four 28, a double piston pneumatic cylinder 29 and a mechanical gripper. The hand 30, the mounting plate 22 is fixed to the top of the bracket 11 in the transverse direction by bolts, the middle of the mounting plate 22 is provided with a circular opening 221, the circular opening 221 penetrates the mounting plate 22, the rotating support 23 can be rotatably mounted on the mounting plate 22. In the circular opening 221, the motor one 21 is installed on the lower surface of the mounting plate 22, the output axis of the motor one 21 is connected to the rotating support 23 in the axial direction, and the output shaft of the motor one 21 drives the rotating support 23 in the circular opening 221. Rotate, the two ends of

the big arm 25 are respectively provided with an upper transmission joint 251 and a lower transmission joint 252, the lower transmission joint 252 is connected to the rotating support 23, the upper transmission joint 251 is rotatably connected to one end of the cylinder type middle arm 27, and two motors 24 is installed on the lower transmission joint 252. The output shaft of the second motor 24 extends into the lower transmission joint 252 and is connected to the boom 25 for transmission. The output shaft of the second motor 24 drives the boom 25 to rotate around the rotating support 23 within a certain range. The motor three 26 is mounted on the upper transmission joint 251, the output shaft of the motor three 26 extends into the upper transmission joint 251 and is connected to one end of the cylinder type middle arm 27 for transmission. The other end of the cylinder type middle arm 27 is fixed with a mounting seat 271, double A movable block 291 is fixed in the middle of the cylinder body of the piston air cylinder 29. The movable block 291 can be rotatably installed in the mounting seat 271. The mechanical gripper 30 is arranged on the two piston rods of the double piston air cylinder 29, and the motor 428 is installed on the mounting seat. On the seat 271, the output shaft of the motor 428 is in transmission connection with the movable block 291. The cylinder type middle arm 27 and the double-piston pneumatic cylinder 29 are all pneumatically connected to the pneumatic transmission system. The pneumatic transmission system is used to transfer the cylinder type middle arm 27 and the double piston the pneumatic cylinder 29 provides power. The cylinder-type middle arm 27 can extend and contract for a certain distance, which can expand the scope of the express delivery. The double-piston pneumatic cylinder 29 has two piston rods, and the two piston rods are facing oppositely. The contraction can drive the mechanical gripper 30 to hold the express, and the extension of the two piston rods of the double-piston pneumatic cylinder 29 can drive the mechanical gripper 30 to lower the express. The bracket 11 is provided with a motor drive system (not shown in the figure). It is used to control motor one 21, motor two 24, motor three 26 and motor four 28. The pneumatic transmission system adopts the conventional pneumatic transmission system on the market.

The robotic arm gripper system 2 also includes an ultrasonic sensor 4 and a code scanning sensor 5. The ultrasonic sensor 4 and the code scanning sensor 5 are both set on the upper surface of the movable block 291. The ultrasonic sensor 4 and the code scanning sensor 5 are both connected to the computer control system 33. Signal connection, the ultrasonic sensor 4 is used to detect the position of the opened empty express cabinet 32, the robotic arm gripper system 2 will deliver the express into the express cabinet 32, and scan the express barcode through the scan code sensor 5 to send the pick-up information to the user.

4. Design of express cabinet system

The express cabinet system 3 includes a frame 31 and a plurality of express cabinets 32 arranged on the frame 31. Each express cabinet 32 includes a cabinet body 321, a cabinet door 322 and a holding electromagnetic lock 323. The cabinet door 322 is connected to the cabinet through a hinge 324. The body 321 can be rotatably connected, a holding electromagnetic lock 323 is installed between the cabinet body 321 and the cabinet door 322, a computer central control system 33, an AGV car 1, a 3D vision sensor 13, a motor drive system, and a pneumatic drive system are installed on the frame 31, The holding electromagnetic lock 323 is connected with the computer central control system 33. The computer central control system 33 can detect the vacant express cabinet 32 and send the position information of the vacant express cabinet 32 to the AGV trolley 1. The AGV trolley 1 will deliver the express Transport to the vacant courier cabinet 32, and trigger the contact and separation of the holding electromagnetic lock 323 under the command of the computer control system 33 to realize the automatic opening and closing or closing of the cabinet door 322; the 3D vision sensor 13 locates the location of the courier After that, it sends a position signal to the computer central control system 33, and the computer central control system 33 controls the start of the motor drive system and the pneumatic drive system to realize the capture of the express.

A cushion rubber pad is pasted on the surface of the holding electromagnetic lock 323 to protect the holding electromagnetic lock 323 from collision.

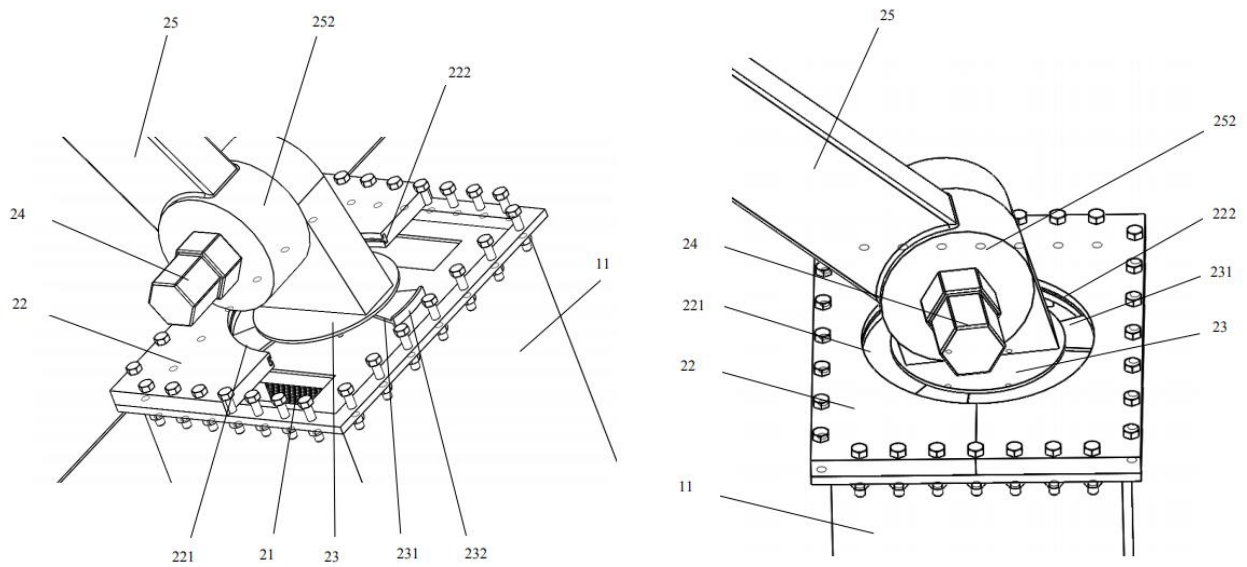


Fig. 3 Connection structure of boom and mounting plate

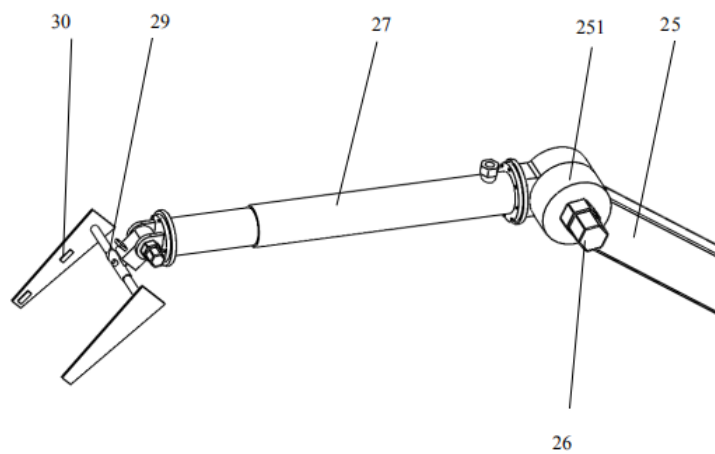


Fig.4 Connection structure of middle arm and big arm

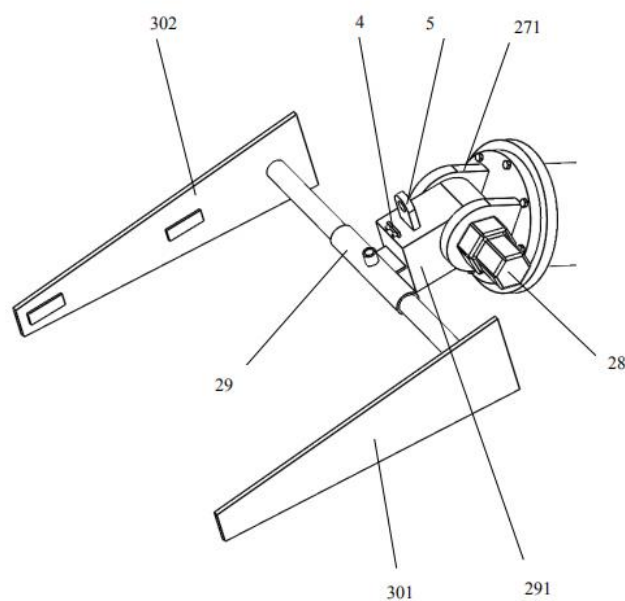


Fig.5 Manipulator joint structure

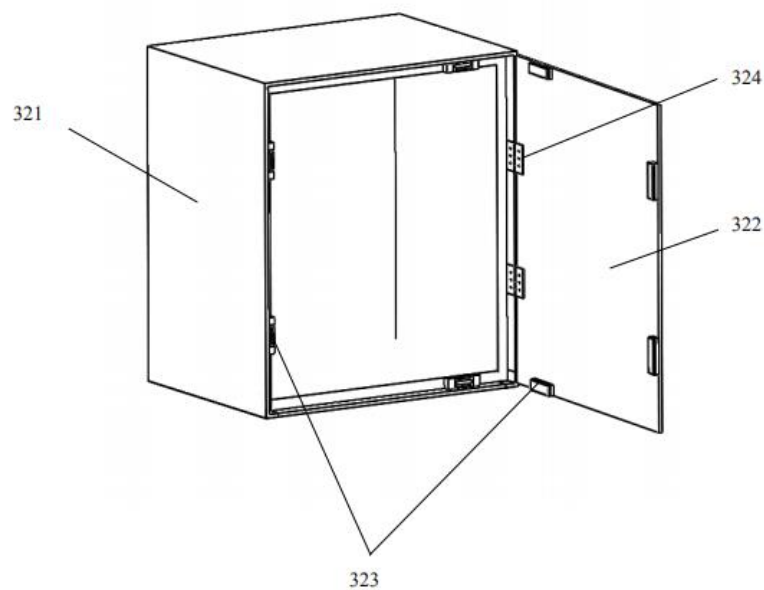


Fig. 6 Express cabinet structure s

5. Conclusion

The fully automatic express delivery equipment carries the robotic arm gripper system on the AGV trolley. The AGV trolley moves to the side of the express cabinet under the control of the computer control system. The robotic arm gripper system has the ability to move freely in multiple directions to grab the express and deliver it to the express cabinet. It also scans the courier barcode through the scan code sensor to send pickup information to users, and waits for users to scan the code to pick up the goods in the express cabinet, improve the efficiency of express delivery in the express service center, and realize the intelligent and fully automated delivery of express delivery.

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