

Research on Express Self-service Pickup Box System

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Abstract

This design discloses a control system of express self-service pickup box, which includes MCU, as well as power drive module, camera module, infrared induction module, keyboard module, electronic lock, electronic lock drive module, GSM mobile phone module, display module and WIFI module connected with MCU. The electric control lock driving module is used for controlling the opening and closing of the electric control lock installed inside the box lattice; The GSM mobile phone module is used to send the random password generated by the system to the customer's mobile phone, and the customer can open the corresponding box door at one time with this password; The display module is used for providing a friendly man-machine interaction interface for couriers and customers; The WIFI module is used for the information connection channel between the self-service pickup box control system and the network server.

Keywords

Express Delivery; Automation; Pickup Box; Control System.

1. Introduction

This is an era of online shopping-in today's era, the successful operation of Alibaba Company has caused many talented people to follow suit, so there are various shopping platforms such as JD.COM, Suning and No.1 shop, etc. E-shopping is more and more accepted by people and has gradually become an indispensable mainstream consumption mode in people's lives. Express industry is the darling of the times, but it is also a great challenge. More and more express delivery is needed, and new technologies should be continuously developed to solve some problems arising in the process of express delivery:

(1) Security issues: In the process of online shopping, the personal information of customers is leaked for no reason, and criminals obtain these personal information through illegal channels, and then pretend to be couriers to deliver express delivery, threatening the personal and property problems of customers.

(2) Manual operation problem: Couriers need to send short messages or call guests one by one, which is very cumbersome, and a lot of communication costs are generated, which increases the cost of express transportation and reduces the work efficiency of couriers.

(3) Whether the guest can pick up the pieces: when the courier encounters the customer's phone call, or the customer is not available to pick up the pieces at that time, the courier has to take the courier away and deliver it at an appointment time, which reduces the efficiency of express delivery.

At present, in order to solve the above problems, e-commerce began to cooperate with some stores in the market, and set up temporary stacking points for express delivery in stores. Although this measure is convenient for customers to pick up items and improves the efficiency of express delivery to some extent, another problem arises-the safety of express delivery. Express delivery is in a store, which only provides space and is not responsible for the safety of express delivery, so express delivery may be lost or damaged.

Traditional express pick-up is tedious, time-consuming and laborious, and sometimes there are potential safety hazards such as impersonator express delivery, so it is urgent to design a convenient, fast, safe and reliable express self-service pick-up box system.

With the increasing volume of express delivery in express delivery industry, the delivery pressure of terminal outlets and dispatchers is increasing day by day. There is a major contradiction between the

dispatcher and the recipient, that is, when the dispatcher delivers, the recipient is not at home or inconvenient to pick up the pieces, and the solution at this time is to leave it at the doorman or deliver it next time. This will not only affect the dispatching efficiency of dispatchers, but also affect the receiving experience of users.

In recent years, a kind of terminal express cabinet has emerged, in which dispatchers need not be placed in open places such as doormen, but in relatively safe lockable express cabinets. Recipients can go to the express cabinets to pick up the pieces directly after work, thus greatly improving the dispatch efficiency. Generally, this kind of express cabinet will be installed at the gate of community or company. However, with the increasing demand of users, the number of express cabinets is constantly increasing. In some large communities, express cabinets are distributed in different locations in the community, but if one recipient has multiple express mails, at this time, the express mails of the same recipient may be placed in different express cabinets because one express cabinet cannot fit, and these express cabinets are located in different locations in the community. For a relatively large community, the recipient needs to run the whole community once. With the increasing number of express cabinets, there are more and more cases in which recipients go back and forth to find express mail in different express cabinets, and the user experience is once again being tested.

In addition, the courier is charged by the courier according to the number of express mails, and each stored express mail will charge a corresponding fee, and the recipient will also charge a corresponding fee if he fails to receive the goods after a timeout, which is not a small fee for the courier and the recipient.

2. Design content

In order to solve the problems existing in the traditional express pick-up link, this design provides a self-service pick-up box control system, which takes MCU as the core, coordinates various functional modules, and completes the self-service pick-up function.

The design is realized by the following technical scheme: a control system for express self-service pickup box, which comprises a self-service pickup box main controller MCU, a power drive module, a camera module, an infrared induction module, a keyboard module, an electric lock, an electric lock drive module, a GSM mobile phone module, a display module and a WIFI module; The main controller MCU takes a single chip microcomputer as the core and is provided with a secondary management password, so that a system administrator can configure and manage the system; The main controller MCU is respectively connected with an input subsystem/an output subsystem, and the input subsystem comprises a power drive module, a camera module, an infrared induction module and a keyboard module; The output subsystem comprises an electric control lock driving module, a GSM mobile phone module, a display module and a WIFI module; The camera module is used for real-time monitoring function. When a user takes a pick-up operation, a group of pictures are automatically taken and uploaded to the server for storage. The administrator can also monitor the scene of the express self-service pick-up box in real time through the network server. The power driving module is used for providing power for each module in the express self-service pickup box system to realize functions; The infrared sensing module is installed in each box to sense whether there is express mail in each box; The keyboard module is used for inputting a 0-9 digit password key, a "put" key, a "take-out" key, a "big" key, a "medium" key, a "small" key and a "OK" key; The electric control lock driving circuit is used for controlling the opening and closing of the electric control lock installed inside the box lattice; The GSM mobile phone module is used to send the random password generated by the system to the customer's mobile phone, and the customer can open the corresponding box door at one time with this password; The display module is used for providing a friendly man-machine interaction interface for couriers and customers; The WIFI module is used for the information connection channel between the self-service pickup box control system and the network server.

According to the specific embodiment of this project, an intelligent household express box comprises an express box body and a main control unit, a scanning unit and a pickup verification unit which are arranged on the express box body; The upper part of the express box body is provided with a delivery port, and the lower part is provided with a pickup port; The main control unit is used for sending a verification code to the mobile phone number initiating the delivery signal after acquiring the delivery signal, and verifying the identity of the initiator of the delivery signal based on the verification code; The main control unit is also used for opening the scanning unit to obtain the express delivery number after successful verification, opening the delivery port after obtaining the express delivery number, and sending delivery completion information to the recipient corresponding to the express delivery number after the delivery port is closed; And the pickup verification unit is used for verifying the identity of the recipient and opening the pickup statement to pick up the recipient after the verification is successful. The main control unit is also used for opening the pickup port after receiving the door opening signal sent by the recipient. The main control unit comprises an industrial touch screen and a communication module; The industrial touch screen is used for acquiring the mobile phone number after acquiring the release signal; The communication module is used for sending the verification code to the mobile phone number; The industrial touch screen is also used for inputting the verification code, and the communication module is used for verifying the verification code, opening the scanning unit to obtain the express delivery number, opening the delivery port after obtaining the express delivery number, and sending delivery completion information to the recipient corresponding to the express delivery number after the delivery port is closed. The communication module is also used for controlling the pick-up port to open after receiving the door opening signal sent by the recipient.

The pick-up verification unit comprises a fingerprint recognizer, which is used for acquiring the fingerprint of the recipient to verify the identity information of the recipient, and opening the pick-up statement to pick up the recipient after the verification is successful. The pick-up verification unit also comprises a digital password keyboard, which is used for obtaining the password input by the recipient to verify the identity information of the recipient and opening the pick-up statement to pick up the recipient after the verification is successful. The delivery port and the pickup port are both provided with safety doors equipped with electromagnetic locks. A distance sensor is arranged in the express box body and used for sending alarm information to the main control unit when the safety door is not closed. Communication module communicates based on 4G or 5G. The intelligent household express box also comprises a positioning device which is arranged inside the express box body and used for real-time positioning of the express box body.

3. Detailed description of the invention

The design will be described in further detail with examples and drawings below, but the implementation of the design is not limited to this.

Examples

As shown in Figure 1, this design includes control subsystem, man-machine interaction subsystem, monitoring and communication subsystem. The control subsystem is the control core of the whole system, which is responsible for coordinating the normal work and monitoring of each part of the self-service pickup box, providing man-machine interaction information and outputting control drive signals. It structurally includes the pickup box main controller MCU(6) and the power drive module (1), camera module (2), infrared induction module (3), keyboard module (4) and electric lock drive module (7) which are connected WIFI the MCU(6) respectively

The main controller MCU of this design selects STC12C5A60S2 single chip microcomputer produced by STC, which is a new generation 51 single chip microcomputer with single clock/machine cycle, high speed/low power consumption/super anti-interference. Its instruction code is completely compatible with the traditional 51 MCU, but its speed is 8-12 times faster.

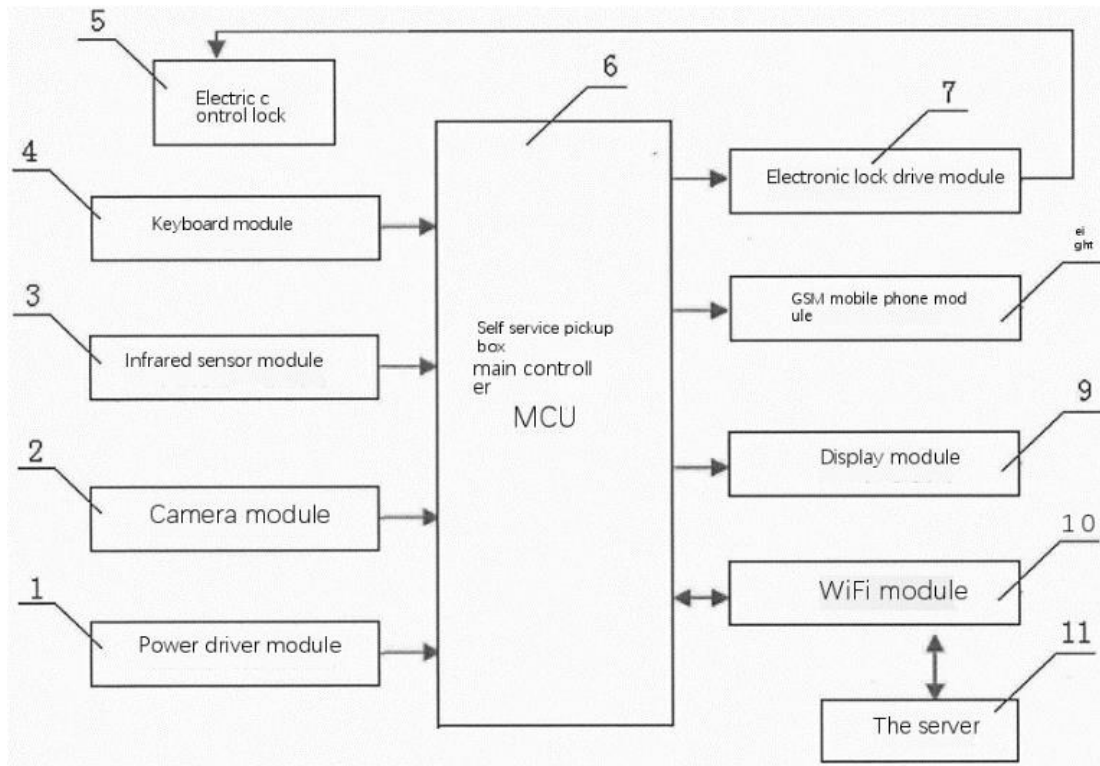


Figure 1. Schematic diagram of the structure of this design

In this design, Quason4X4 matrix touch film keyboard module is selected, and the 8P DuPont head can be inserted on the row pin to connect the circuit, and the connection mode is simple and easy to operate. The power drive module mainly considers that the output voltage is 5V and 24V, which has the characteristics of temperature protection, overcurrent protection and short circuit protection, EMI filter circuit for input and output, indicator lamp and mounting hole, high reliability and high cost performance. In order to improve the user's handling in and out of express mail, touch circuit design is adopted for the keys. TTP229 is a touch chip designed based on the principle of capacitance induction. The built-in voltage stabilizing circuit of the chip can be used by touch sensors, and the stable touch effect can be applied to various applications. The human touch panel can be connected by non-conductive insulating materials.

OLED (Organic Light Emitting Diode) is selected as the display module (9), and the resolution is 128*64.

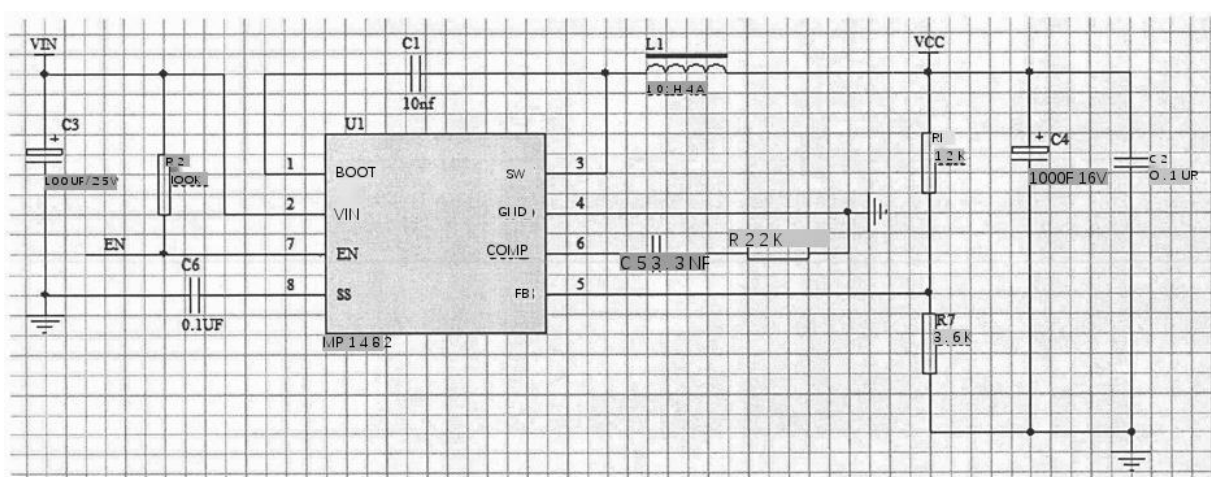


Figure 2. Schematic diagram of GSM mobile phone communication module

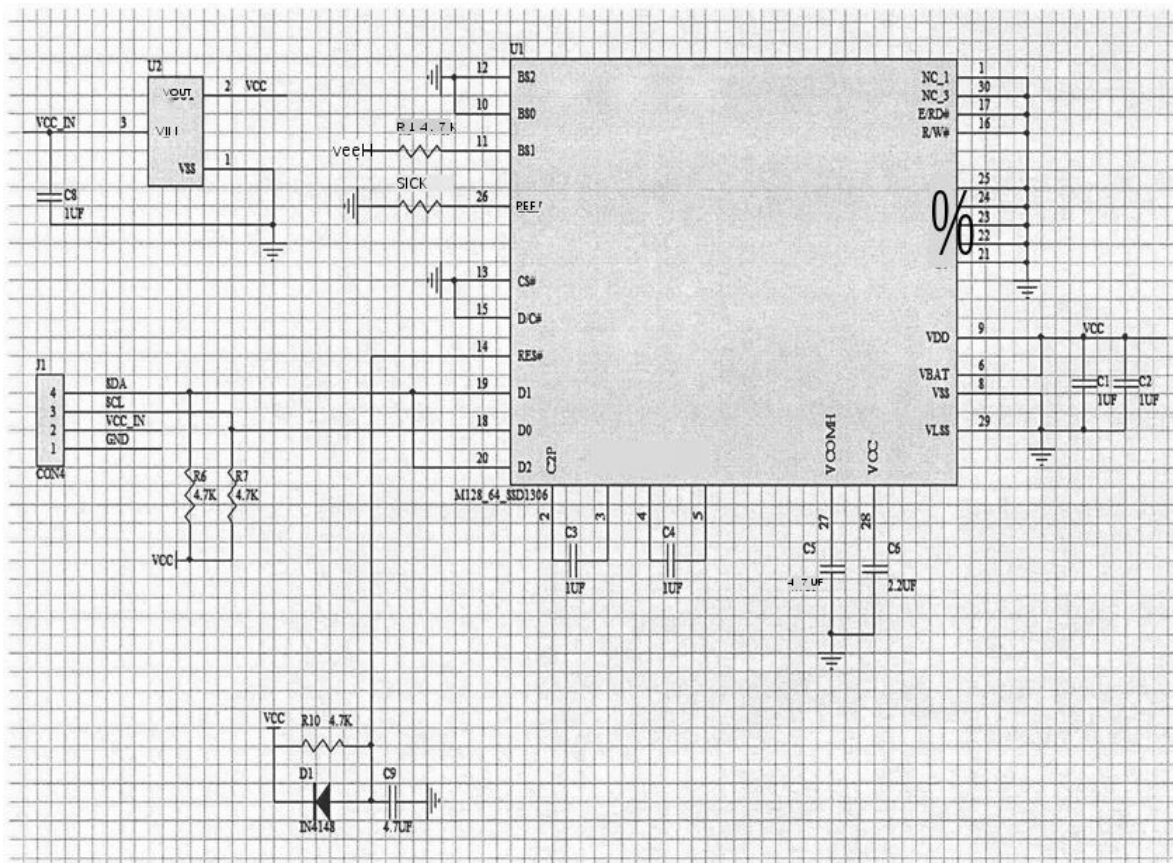


Figure 3. Circuit schematic diagram of display module

In order to improve the user's handling in and out of express mail, touch circuit design is adopted for the keys. TTP229 is a touch chip designed based on the principle of capacitance induction. The built-in voltage stabilizing circuit of the chip can be used by touch sensors, and the stable touch effect can be applied to various applications. The human touch panel can be connected by non-conductive insulating materials.

The infrared sensing module (3) selects HC-SR501 human body sensing sensor, and when the sensor detects that a user picks up a piece, it sends a control signal to the MCU, and the MCU starts the camera (2) to take a photo, and the photo image information is transmitted to the network server for storage via WIFI.

4. Concluding remarks

A delivery port and a pick-up port are arranged on the express box body, so that the courier can deliver the express mail. After the identity of the courier is verified by the main control unit, the scanning unit is started to scan the express mail to be delivered to obtain recipient information. At the same time, the main control unit opens the delivery port for the courier to deliver, and sends a short message to the recipient's mobile phone number to prompt the courier to deliver the express mail. The recipient can take out the express mail only after verifying the identity through the forensic verification unit on the courier box. The courier box can be set at the convenient location for the recipient to pick up the goods and be used exclusively by the courier and the recipient, thus reducing the courier cost and serving the users better, and avoiding the fatigue of the frequent shopping recipients because of looking for cabinets everywhere.

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