Design of Control System for Cargo Conveyor Based on PLC S7-300

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Abstract: According to the requirement of automation system, the control system of industrial goods transmission device is designed. In the system, the control part is based on touch screen module and programmable controller, and the execution part is composed of a variety of cylinders driven by electromagnetic reversing valve. The system realizes the full automatic operation of material transmission and completes the material transmission.

1. Introduction

With the development of industrial automation technology, people use PLC to carry out automatic control of cargo transportation [1]. PLC technology is widely used in industrial field because of its high reliability, easy programming and easy control. At present, in the automatic control system of cargo handling, PLC technology is also used to design the control system to enhance the reliability and convenience of cargo handling. Referring to the actual needs of users, combined with the actual characteristics of PLC technology, the actual conveyor belt can be accurately completed effectively. After the application of PLC, the control level of the transmission device is improved.

2. Composition of cargo conveyor system

In this paper, the pneumatic test bench is used as the experimental platform. The system is composed of material platform 1 transmission system, material platform 2 conveying system and material platform 3 conveying system. The control system uses modular combination, including touch PLC module, interface module, button module, solenoid valve module and various sensors. The overall structure is shown in Figure 1.

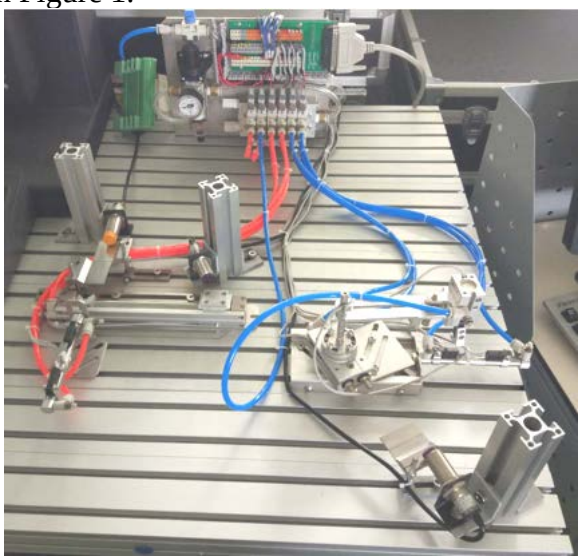

Figure 1 The overall structure

The electrical part is composed of PLC, interface board and sensor. The PLC uses Siemens S7-300, including power module, CPU module, digital input module and digital output module. The model of power supply module is PS307 5PA, the signal of CPU module is CPU315-2DP, the model of digital

input module is SM321, and the model of digital output module is SM322. Figure 2 shows the structure of the electrical part.

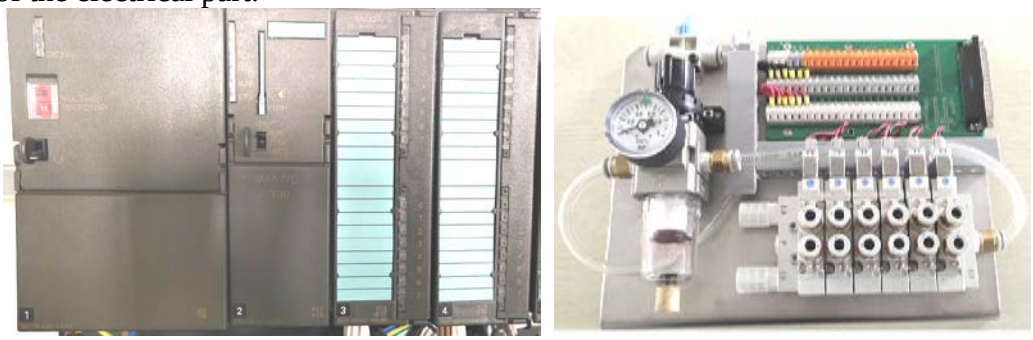

Figure 2 The structure of the electrical part

3. System control requirements and I/O settings

3.1. Control requirements

After the system starts, press the start button, the sensor of No. 1 feeding platform senses the material, the manipulator picks up the material, the manipulator clamps the magnetic switch to get the signal, the pusher cylinder 2 extends the signal, the pusher cylinder 2 extends the limit magnetic switch to get the signal, the rotary cylinder left pendulum, the rotary cylinder left limit magnetic switch to get the signal, the manipulator loosenses the material, the sensor of No. 2 feeding platform gets the signal, and the material is transported. The left pendulum of the cylinder, the magnetic switch of the left limit of the feeding cylinder get the signal, the pushing cylinder 1 extends out and pushes the material to the No.3 feeding table. The sensor of the No.3 feeding table is an inductance sensor. Because there are too few sensors to signal, the device can operate repeatedly at this time. There are two materials in the No.3 feeding table. The sensor of the No.3 feeding table gets the signal and the device stops working. The device can be operated at any time. The device can stop by pressing the stop button step by step.

3.2. I/O settings

According to the control requirements, the I/O settings are defined as Table 1.

Table 1

Input			Output		
SN	**Address**	**Comments**	**SN**	**Address**	**Comments**
1	I0.0	start	**1**	Q0.0	Manipulator tretched
2	I0.1	stop	**2**	Q0.1	Left arm swing
3	I0.2	No.1 Material Platform	**3**	Q0.3	Left row of freight
4	I0.3	No.2 Material Platform	**4**	Q0.4	Push out
5	I0.4	No.3 Material Platform	**5**	Q0.5	Claw clamping
6	I0.5	Hold on tight			
7	I0.6	Manipulator in place			
8	I0.7	Manipulator retracts to position			
9	I1.0	Put Right in place			
10	I1.1	Put left in place			
11	I1.2	Left Limit			
12	I1.3	Right Limit			
13	I1.4	Pusher cylinder in place			
14	I1.5	Push cylinder retracts to position			

4. Sequential Function Diagram

Sequential Function Diagram (SFG) programming is a relatively new graphical programming method. It uses flow charts to express a sequence control process, which consists of steps, transformation conditions and directional links. [4] The programming idea of sequential control method is to divide a work cycle of the system into several stages connected in sequence [5]. The sequence function diagram of the cargo conveyor is shown in Figure 3.

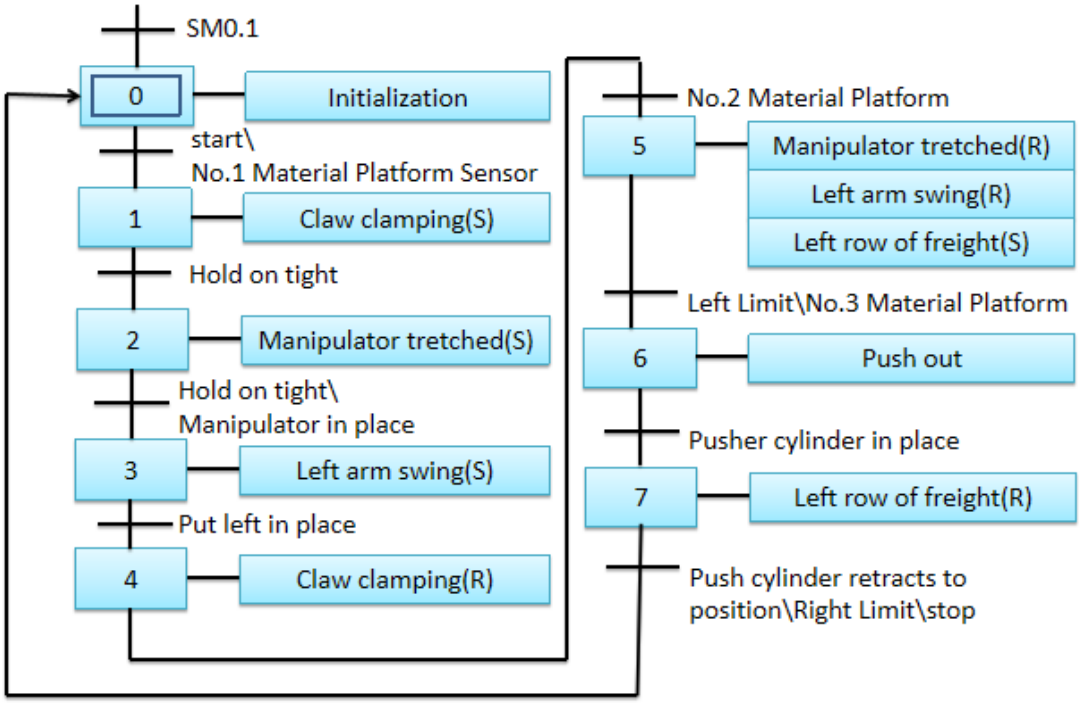

Figure 3 Sequence function diagram

5. Conclusion

This paper realizes the function of automatic cargo transmission based on the pneumatic experimental device. Through the analysis of control requirements, I/O settings of the system are established. The function of the system is designed according to the work flow.

Acknowledgements

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