The research of mental wire reel based on the MITSUBISHI PLC and touch screen

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Abstract

Through the study of domestic and foreign metal wire disk NC molding equipment and control system. The traditional wire reel wire bending machine control system are hard to realize the three-dimensional processing.It is difficult to complete a one-time continuous machining and the machining precision is low.The labor intensity of the operation personnel are big. Therefore, the research of this control system is of far-reaching significance. This paper mainly introduces the Mitsubishi FX2N series PLC and touch screen in metal wire disc NC forming control system application and elaborated the system constitute.The purpose is to realize the automatic control of the system.

Keywords

Working principle, control mode, FX2N series PLC.

1. Introduction

With the survey shows that China is now the world's largest welding material producing countries. The basic use of plastic wire tray packaging. More and more countries adopt metal wire to replace traditional plastic welding wire, with the enhancement of environmental protection consciousness. The development of welding wire plate technology is mainly concentrated in the developed countries in Europe and the United States, such as France's NUMALLIANCE Company, the United States AIM company, Germany's WAFIOS company and so on. Especially to the famous French NUMALLIANCE company production ROBOMAC series of CNC wire bending machine, it has a powerful computer numerical control (CNC) system, which actuator is by brush AC servo motor to drive and control and It has electric clamping and cutting device, has a certain function of NC.

 By consulting the relevant literature is that China has not developed a high degree of automation, continuous processing pipeline material bending device in three-dimensional space, only some of the relevant aspects of the research, lack of independent development of the core technology of advanced CNC wire bending machine. Therefore, it is necessary to research the numerical control bending machine, and develop a set of efficient automation equipment.

2. The overall scheme design of the system

This article involves the metal wire disc CNC system with Mitsubishi PLC as master control parts, the motor traction wire feeding and cutting tool is driven, adopting the limit switch is fixed length, rotation is controlled by an electric motor gear grinder, the gas driven axial movement of the worktable, and industrial touch screen man-machine interaction, the overall system block diagram as shown in Figure 1

After the device is started, the user can manually debug and parameter settings by clicking on the touch screen, and control the system operation. After the operation of the system, the controller drives the wire feeding motor wire feeding, and lead the straightening wheel steel wire straightening, straightening wire top open limit switch. At the same time, the wire feeding motor is stopped, and the driving knife motor drives the cutting knife to cut off the steel wire. PLC output port through the

control of the change, the steel wire into the mold for a bending, two bending. Finally the gas is composed of a movable top, top of wire semi-finished products need to spot welding, indexing disc by encoding the stepper motor angular displacement is converted to the electrical signal of the PLC access, through the output end of the PLC controlled stepper motor, finally finished again screw launched control process is complete.

When the equipment failure, PLC through the relay control alarm. At the same time, the touch screen will display the corresponding fault tips, then the user can click the touch screen on the "fault reset", the alarm lamp to stop the alarm. Fault prompt eliminates, then carries on the fault processing operation, maintenance breakdown equipment.
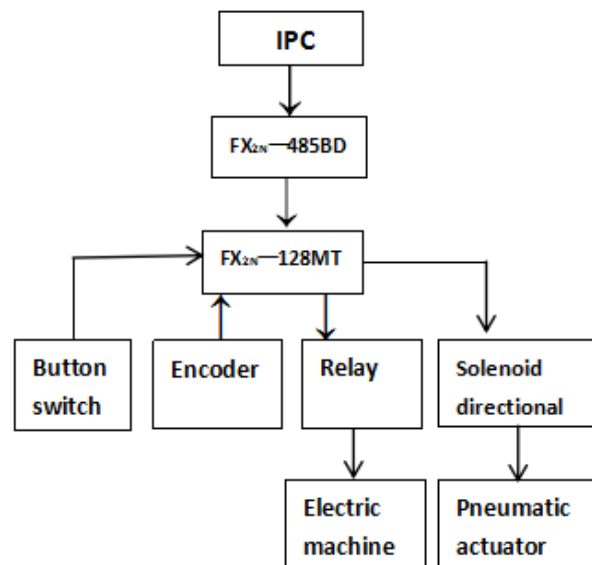
Fig1 flow chart of system

3. Hardware design of control system

Programmable logic controller has small volume, strong function, high reliability, strong anti-interference ability, simple programming, convenient maintenance, etc., especially adapt to the harsh factory environment, making it has been widely applied in industry, in this paper, the design of the control system mainly includes the PLC selection, touch screen selection, I / O points address assignment and PLC system external wiring diagram.

3.1 Selection of PLC models

According to the control requirements and control function analysis, the selection of PLC selection FX2N-128MT. FX2N series PLC has 64 input ports and 64 output ports, is the MITSUBISHI FX series PLC features a more powerful models. Its fastest speed, the largest capacity, is the highest grade of the FX series of small programs, the application is very wide. Can provide a variety of special function module, can realize the process control and position control, there are a variety of serial communication module or function expansion board to support network communication.

3.2 Distribution address of the I/O port of the control system of the welding wire

The distribution of I/O in the control system of metal wire panel is shown in Table 2:

Table 2 I/O address assignment of welding wire control system

I/O point address	Explain	I/O point address	Explain
X00	Wire feeding	Y00	Starting wire feed
X01	Return trip	Y01	Motor return
X02	Limit switch start	Y02	Cutting knife down

X03	Limit switch stop	Y03	Cut off the knife up
X04	Cutting knife down	Y04	Curved wire motor
X05	Cutter return	Y05	Pneumatic device down
X06	Bending	Y06	Rise of device
X07	Reversing	Y07	Wire feed start
X10	Bend again	Y10	Indexing
X11	Return trip	Y11	Launch pad
X12	Indexing	Y12	
X15	Ejector	Y15	
X16	Return trip	Y16	

3.3 Selection of touch screen

As a new type of man-machine interface, touch screen has a simple and easy to use function and excellent stability to make it very suitable for complex industrial environment. In order to operate simple, to obtain a more ideal human-computer interaction, we choose the MITSUBISHI F940GOT. The model of touch screen is a kind of general graphic operation terminal which has advanced display function, alarm processing ability and PLC control program editing function. Its operation is very simple, in accordance with the humanized design, is the most popular standard size.

4. Software design of control system for metal wire plate

According to the design and control principle of the control system hardware design and the control principle of the metal wire plate numerical control bending machine, the overall idea of the software is to combine the touch screen programming with the PLC program design. Touch screen program design of the main contents of the interface design, color selection, window switch, function button, as well as with the PLC communication configuration, etc.. PLC program design of the main contents of the power on initialization, data processing, the mode of production, as well as fault processing. The following will be the touch screen program and PLC program design ideas and methods to carry out specific introduction.

4.1 Touch screen programming

The setting of key process parameters, process flow, operation status and alarm display can be carried out through the touch screen window. Its use for the whole welding wire plate production process has brought great convenience. According to the production requirements of the NC bending machine control system, the parameters of the touch screen are designed. The touch screen is required to control the operation and stop of the whole production equipment, and can manually control the direction change of the reversing mould, and the emergency stop of the fault.

4.2 Software design of CNC forming system for welding wire

This system uses the trapezoidal chart language to carry on the software programming to the MITSUBISHI FX2N programmable logic controller, uses the MITSUBISHI PLC monitoring function to carry on the program debugging. According to the overall requirements of the system and the principle of the machine, the PLC program design includes the function of the system software such as the power initialization, data processing, the independent production method, the dynamic cutting tool adjustment and fault processing.

Semi automatic production mode is the main mode of production of wire plate CNC system and its working principle is according to the principle of PLC control, through the PLC control solenoid valve, through the electromagnetic valve to control the production of motor and change the mold, and reinforced the send thread and finished product launches and so on.

First, the system initialization parameter settings, some of the data registers and reset the timer reset; single step debugging procedures: the use of system debugging for maintenance personnel to use. PLC according to the working state of the equipment, which in turn control of relays, motor coordination with in order to finish feeding, straightening and cutting operation. Then the steel wire into the mold, and then through the motor to bend the wire and so on. When the control system fails, the touch screen display failure, brake the entire production equipment, to be resolved after the failure, the manual can reset the reproduction

5. Conclusion

In this paper, the use of the Mitsubishi FX2N series can be programmable logic controller as the control core, introduces the metal wire wheel control the overall framework of the system and its design principle, hardware design mainly consider the working principle of the actuator, using a bending, the clamp reversing bent again, so as to achieve the three-dimensional space of the bending process, through the touch screen as man-machine interface and improve the operability of the production. The control system actual operation proves that the system has high reliability and stability, the automation level and production efficiency of the products has been improved significantly, greatly reducing the labor intensity of workers, has achieved obvious economic benefits.

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