

Design on Automatic Rolling System for Agricultural Greenhouse-Part II

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Abstract. This paper is introduced by a kind of agricultural greenhouse automatic winding system, according to the changes in light intensity and temperature change to adjust the greenhouses mesh opening, when the current is too large or motor block or send out alarm when turning, and then stop the motor work. When the temperature is above or below the present value, the single-chip microprocessor controls the fan or the electric engine to reach the range of the present value.

1. Introduction

As the saying goes "saying" claims, vegetables as a country is very important strategic reserves, in the maintenance of the food market and social stability, ensure that the interests of farmers, guarantee the important roles in the work, such as national security. Our government has been taking the production and management of vegetables as a very important economic work. With the development and maturity of SCM technology, the detection, control and management of the control system has become a reality. Within the key factors affecting the quality of greenhouse crop canopy temperature, humidity and light intensity, and so on, therefore, to ensure the production of vegetable crops, strict control of temperature in the greenhouse and light intensity. In this paper, the automatic rewinding system of agricultural large - shed network based on STC89C51 single chip microcomputer is introduced.

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2. Whole system structure

Temperature sensor and the photosensitive sensor will be collected in the greenhouse in the temperature and light intensity information transmitted to MCU ST89C52, temperature information after ST89C52 treatment, temperature will be displayed on the LCD display module, greenhouses mesh opening and time, the user can set a temperature and light intensity in advance preset range, when the temperature of the inside the greenhouse is not in default, system will signal pulse, turn on a fan or open the heating machine. When the light intensity is beyond the scope of the default, the system will also be a pulse signals, open or closed shutter machine if the high canopy shutter electromechanical or motor loss or jam, system will send alarm and stop the operation. Communication between MCU and PC USES RS232 communication. The whole system structure is shown in Fig. 1.

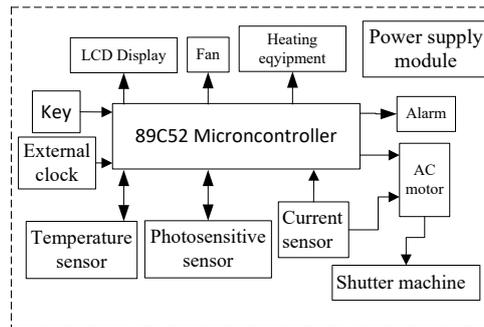


Fig. 1. System block diagram

3. SCM minimum system

The smallest single chip microcomputer system can make the single-chip computer work normally, and can play the core controller of the normal function of a complete computer system. There are output devices, timers, communication interfaces, all of which need to be concentrated on a small chip. STC89C52 is a low power consumption and high performance CMOS8 microcontroller produced by STC, with an 8K byte system programmable Flash memory. STC89C52 USES the classic McS-51 kernel, but has made a lot of improvements to make the chip have the function that the traditional 51 MCU does not have. On a single chip, with a smart 8-bit CPU and a system programmable Flash, STC89C52 provides a highly flexible and super-efficient solution for many embedded control applications.

4. Circuit design

4.1 Page Setup

The external power supply of this design is 220V power frequency ac power supply. In order to make the system work properly, it is necessary to carry out the steps of variable pressure, rectification, filtering and stabilization. Turn the 220V ac into 5V, 15V and -15v DC.

LM78/LM79 series three-terminal voltage regulator chip to form a regulated power supply does not need too many peripheral components, and have over-current, overheating and adjusting pipe protection circuit integrated inside the chip, the series of integrated voltage regulator IC model of LM78 or LM79 behind the number represents the three-terminal integrated voltage stabilizing circuit output voltage, as shown in Fig. 2.

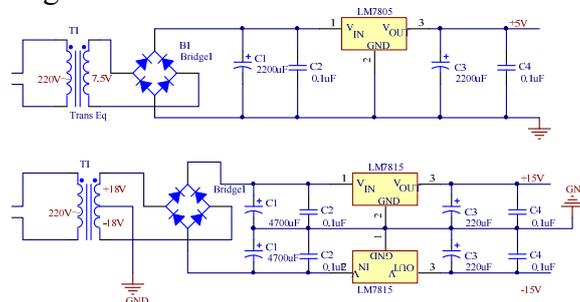


Fig. 2. Power circuit

4.2 Motor circuit

The ac motor is used to realize automatic winding of the network. The single chip cannot directly control the motor. We choose the relay to control the motor. The main/secondary windings of the single-phase motor are different, and cannot be used for switching the main/secondary windings, otherwise, the motor will be burnt. General agricultural single-phase motor should have four terminals: 1/2 main windings, 3/4 as secondary windings, positive rotation. If the reverse rotation is

to be reversed, the correct method is to exchange the front and tail of a winding, so four relays are used to control the motor circuit. The motor module circuit is shown in Fig. 3.

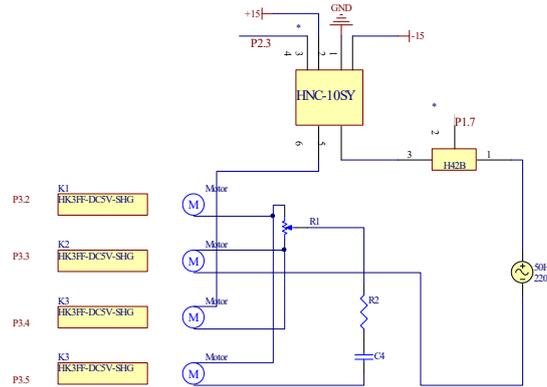


Fig. 3. Motor circuit

4.3 Measuring temperature and illumination intensity circuit

The design is to detect the temperature in the greenhouse, and the temperature sensor adopts the digital temperature sensor DS18B20 produced by DALLAS company. The temperature sensor DS18B20 adopts the interface of the "first line bus", which not only makes the sensor network easy and convenient, but also compares the economy. The wiring of DS18B20 is very simple, with only three pins on the outside. When the external power supply is used, the VDD pin is connected to the power supply, GND pin is grounded, and DQ pin is directly connected to an I/O port of the single chip.

TSL2550 is the light sensor, and its SMBCLK is the clock signal of SMBus serial clock input terminal -SMBus serial data. SMBD is serial data I/O for I/O SMBus serial data I/O terminals -SMBus. VDD connect the power supply voltage. The interface circuits of DS18B20 and TSL2550 are shown in Fig. 4 and Fig. 5.

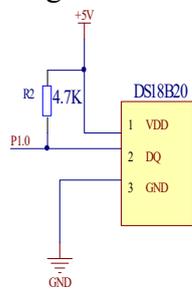


Fig. 4. DS18B20 interface circuit

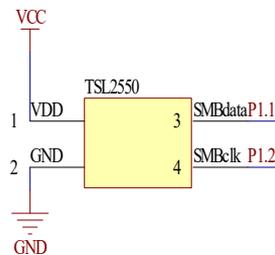


Fig. 5. TSL2550 interface circuit

4.4 LCD display circuit

Liquid crystal display circuit mainly displays the temperature in the granary in real time. Liquid crystal display module used LCD12864, LCD12864 is a 4 bit / 8-bit parallel line, line 2 or 3 serial interface methods, internal contain gb first class and second class of the simplified Chinese character bitmap graphics LCD module; The display resolution is 128 by 64, with 8192 Chinese characters and 128 16-by-8-point ASCII character sets. The interface of this module is flexible and easy to operate, which can form the human-computer interactive graphic interface in Chinese. Another feature is low voltage and low power consumption. Compared with the graphic dot matrix LCD module of the same type, composed of the module, liquid crystal display (LCD) regardless of hardware circuit structure, or display program is much more concise, and the cost of the module is slightly lower than the same bitmap graphics LCD module. The liquid crystal display circuit is shown in Fig. 6.

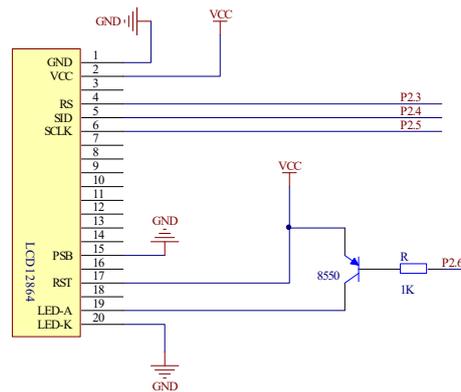


Fig. 6. Liquid crystal display circuit

4.5 Clock circuit

The clock circuit has the function of clock display and time setting. In order to improve the timing precision, DS1302 is used as the main timing chip, which has the advantages of simple interface, low price and convenient use. This module introduces the DS1302 real-time clock circuit is DALLAS company a capable of trickling water fine current charging circuit, its main characteristic is USES the serial data transmission, can provide a programmable for power-fail protection power source to charge function, but also can close the charging function. DS1302 can also be timed under a very small backup power supply, and can be programmed to choose the charging current to charge the backup power, which can ensure that the backup power supply is basically free of power. Save energy and extend working hours.

5. System software design

System initialization, such as transistors, the user can set temperature and time, and the parameters of the light intensity, measuring element began to work, to process the information transmitted to the microcontroller will be collected, and then on the liquid crystal display, at the same time the clock is displayed on the LCD, through button can switch display project, when the light intensity is too big, start the roller machine, its membrane cover, the opposite by opening the lamp to supplement the light intensity; When the temperature is too high, start the fan and reduce the temperature to set value. Otherwise, the temperature in the greenhouse will be replaced by the heating rod, so that the temperature can reach the set value. If the roller blinds or the current is too large, the system will alarm and stop the motor.

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