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The Design of the Pulsing Vacuum Sterilization

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Abstract: It is proposed a pulsing vacuum sterilization control machine which uses 89C55 microcontroller as the main body. The system has stable performance, compact structure, powerful function, fast A/D conversion speed , high collect efficiency. It has a strong competitive power in similar products and has a bright prospect in the economic benefit.

Keywords: pulsing vacuum sterilization; hardware; software

1. Introduction

Disinfection is one of the most important and basic work in the hospital, with needs of the medical work and the development of medical devices, the medical profession puts forward higher request and expectations to disinfection work. Therefore, enterprises are also trying to research and develop new sterilization equipment which is suitable for today's need. New sterilization equipment must have efficient, low temperature, the warp and non-toxic characteristics, scientific and technological personnel from all counties are committed to a more perfect medical sterilizing equipment research.

This paper realized a control machine structure which uses 89C55 microcontroller as the main body, it adopted the new achievements of integrated circuit and LCD design and achieved the system of Chinese menu's display and operation. This system has stable performance, compact structure, powerful function, fast A/D conversion speed , high collect efficiency and the control channel reached the requirement of all kinds control performance index completely to temperature, pressure, heating, time and so on. Strong anti-interference, accord with the on-site work requirements, cost-effective, it has a strong competitive power in similar products and has a bright prospect in the economic benefit.

2. The Working Principle of the Pulsing Vacuum Sterilization

Pulsing vacuum sterilization which uses saturation pressure steam as sterilization medium taking advantage of the latent heat released by high pressure and high thermal steam for the thoroughly sterilization to objects, is a kind of relatively advanced sterilization equipment used by Large and medium hospital, pharmaceutical industry and research.

As shown in Figure 1, pot body of pulsing vacuum sterilization is designed into double pot body form namely the inside pot and the outside pot, each pot body has admission valve, air release valve, pressure gauges and thermometer etc, respectively. The sterilization items sterilize in the inside pot and the inside pot has drying valve, vacuum valve, etc.

3. Hardware Structure

According to the control demanding function sterilization, constructs a sterilization control functions completely, has good human-machine interaction interface and should have printed parameter function, in addition must have serial communication function etc, according to these function demands, designs an overall program. According to the process and various parameters chosen by the users through controlling the keyboard, control system using relay drive heater, solenoid and vacuum pump to realize using saturated steam as medium, sterilize in a short time effectively. In the sterilization process , temperature and pressure through AD, various abnormal state by digital quantity input channel deliver to CPU, and show each technological process and state parameters through LCD; In addition, using the DS12C887 provide real-time clock to CPU; the sterilization process is printed by the micro printer in the middle the sterilization process. The hardware structure is shown in Figure 3.

4. The Design of Software

4.1. Main Program

The software of this system includes main program of control system, interrupt service routines and functional subroutines composition. The task of the main program's control system is to initialize the system, realize the input of parameters and the temperature and time's display of the sterilization and control the sterilization in normal

operation. Interrupt service routines achieves timing sampling and output control.

4.2. The Vacuum Sterilization and Drying Subroutine

In the sterilization stage we should adjust the pressure of the sterilizer's inlet steam to rated pressure, then using the vacuum pump draw sterilization chamber to a higher vacuum degree (the low limit of impulse), and filling with steam to the settled positive pressure (the impulse's superior limit), so the process with a negative pulse and a positive pulse is a pulse cycle. After a few times of impulse the cold air will be exhausted basically, then fill saturation steam to achieve different sterilization temperature corresponding to sterilized items, start accumulative sterilization, when the time is ended, we should keep the vacuum drying to make sure the sterilized items achieving better dryness and be used directly, thus we will achieve a good sterilization effect, the vacuum drying stages process is shown in Figure 3.

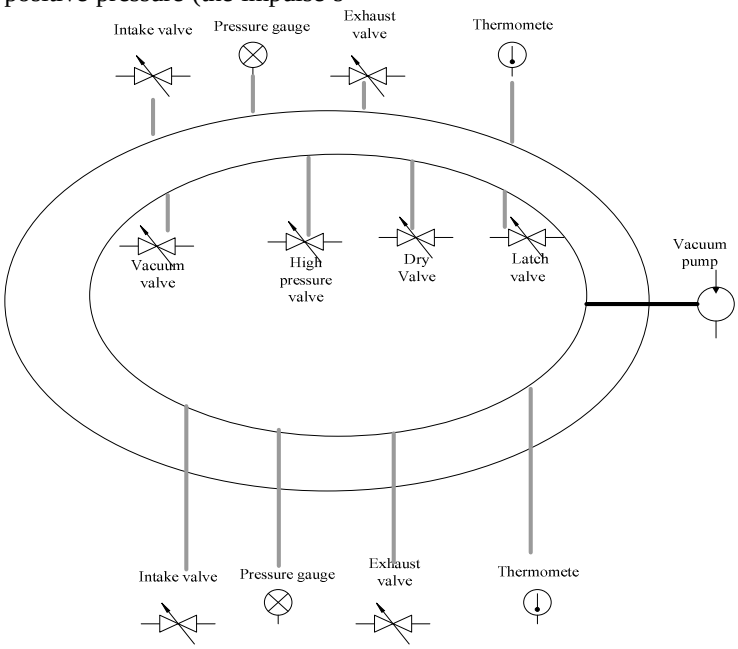

Figure 1. The Pulsing Vacuum Sterilization

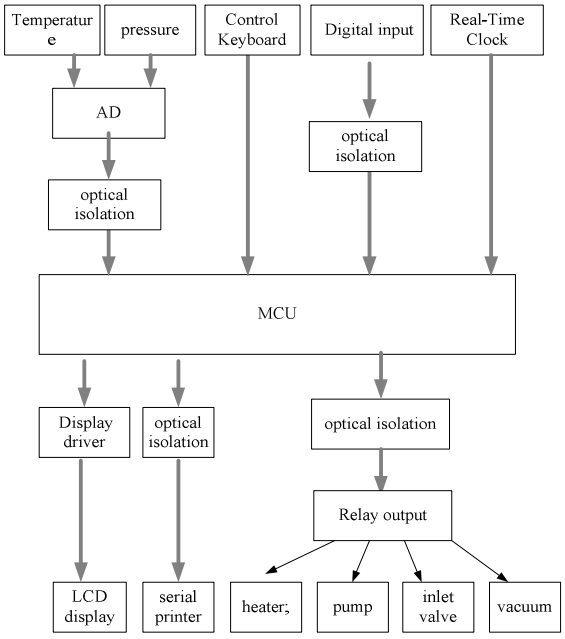

Figure 2. The Hardware Diagram.

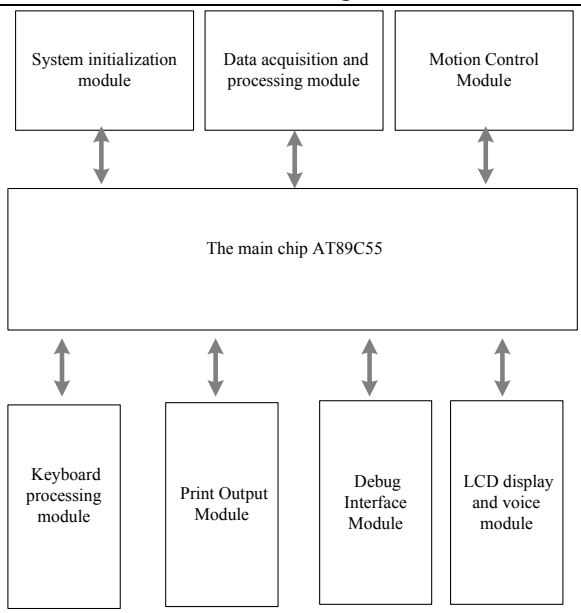

Figure 3. The Design of Software

5. Conclusion

This paper adopts pulsing vacuum sterilization based on single chip through the control to main parameters of sterilization, temperature, pressure and time, it can sterilize and dry quickly and thoroughly to the material bags, glassware bags, apparatus bags, medical gloves and so on. Pulsing vacuum sterilization reaches the process's set to the all-weather automatically and achieves sterilize timing, fixed temperature. It has such advantages as the thorough sterilization , time is short, low energy consumption, no pollution, disinfection with good quality, safe and stable, reliable performance, good work environment and so on.

References

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