

Design and study of a vacuum filling device

Lifeng Zhu¹, Kai Wang², Zheng Li²

¹Changchun University of Science and Technology, Changchun 130022, China

²Changchun Institute of Equipment and Process, Changchun 130012, China

Abstract

Liquid glue in the filling process easy and air contact, so to avoid the chemical reaction caused by the failure of the problem, must ensure that filling in sealing conditions. This paper introduces the design process of a kind of vacuum filling device. The hydraulic pressure cylinder is used to push the pressure and the pressure in the barrel is kept within a certain range.

Keywords

Vacuum; filling method; design.

1. Introduction

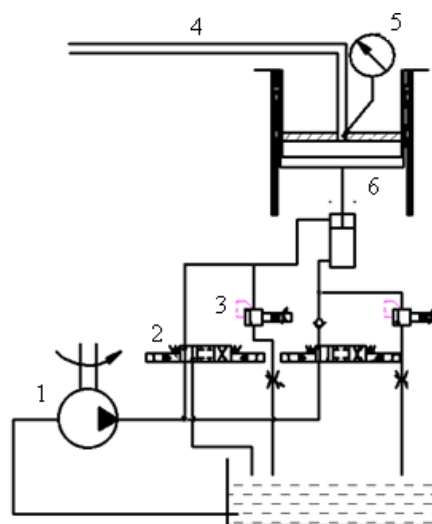
Liquid glue in the production of the final stage of the need to be fitted into a sealed container, which is not only conducive to the preservation of transport and sales. In order to prevent the chemical reaction between the liquid and the air in this process, the plastic failure and the process of filling and sealing are generally carried out under the condition of sealing. In the process of filling glue to ensure that the sealing and guarantee a certain pressure. This requires that the volume of the pressure in the bucket can be changed in a certain range.

2. Design requirements

The method for the object is a high viscosity glue, container for 200kg galvanized iron drum, diameter 560mm, 900 mm high, pouring hose and an end cover fixed filling glue device according to glue barrel pressure changes change irrigation plastic barrel position, in order to ensure the injection tube due to external damage.

3. Scheme design

3.1 System composition



1- Hydraulic pump 2- Reversing valve 3- Relief valve 4- Into the hose 5- Pressure sensor 6- Gravity sensor

Fig.1 Filling device structure

This system is by measuring the pressure and the weight of the bucket to control the hydraulic cylinder piston position and hydraulic cylinder pressure change, so as to ensure that in the sealing conditions to fill plastic bucket and design scheme. Cap and plastic into the pipe fixed, the use of hydraulic cylinder to push the bucket upper and lower to move the bucket pressure within a certain range. Its structure is shown in figure 1.

3.2 Working principle

After the system starts to work, the valve is in the left position, the hydraulic pump is supplied to the hydraulic cylinder, and the piston pushes the oil cylinder to move upwards. When the glue is injected into the plastic bucket, the reversing valve is in neutral position. In the early period of filling in the oil supply position, to ensure that the initial filling plastic bucket can move slightly downward, to overcome the initial resistance of the filling. After the reversing valve is back to the level, the upper end of the cylinder is connected with the oil tank. The proportional relief valve opens the hydraulic oil in the hydraulic cylinder through the proportional relief valve to tank. The pressure relief valve of the proportional relief valve is controlled by a gravity sensor and a pressure sensor.

4. Motion characteristic analysis

In the process of filling control, the force of the system can be expressed in Figure 2.

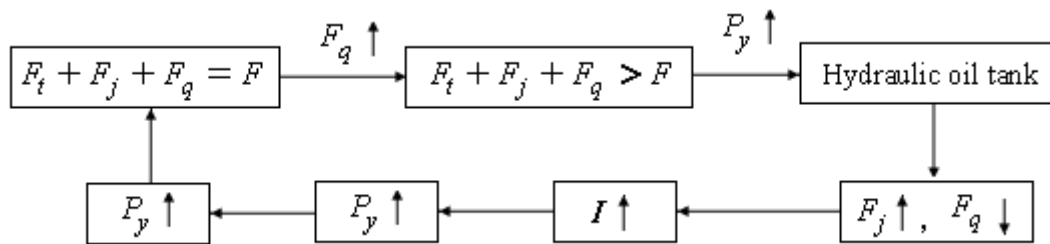


Fig.2 System closed-loop change process

Among them:

F_t —Gravity of the barrel; F_j —Gravity of glue;

F_q —Plastic pressure; F —Hydraulic cylinder thrust;

P_y —Hydraulic oil pressure; F_c —Gravity sensor gravity sensor;

I —Control current of overflow valve; Q_q —Pressure sensor collection.

5. Conclusion

For liquid glue in filling process in the existing problems, this paper designs a kind of vacuum glue filling device. In this system, plastic barrel can with high viscosity glue injection continued downward, plastic bucket pressure in a certain range that air does not enter the oil, can eventually achieve the high viscosity glue injection plastic barrel.

References

- [1] LV Jufang,WANG Yongming. Design and Application of the Precision Glue Irrigation Positioning Fixture[J]. MACHINE TOOL&HYDRAULICS,2013,41(5):11-13
- [2] CHU Kai-bin,WANG Hua,HE Bao-xiang,Research on the type of weighing CNC glue line and its control rules[J]. Manufacturing Automation,2014(11):42-46
- [3] Zhang Hongtao, Li Junfeng. Design and Implementation of a High Precision Glue System in Electronic Glue Machine Based on DSP[J]. Computer Measurement & Control, 2013, 21(12): 3408-3410