A Study of the Design of a Flattened Printed Electronic Equipments

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ABSTRACT

In the recent years, printed electronics has been initially applied in various related fields, however, there are still many problems to be solved, for instance, the existing printing electronic equipments are basically monochrome printing, and double color or multicolor overprint is still in the laboratory. In order to solve the problem of double color printing of printing electronic equipments, this paper introduces a kind of circular applanation type double color overprint printing of electronic equipment, and elaborates its working control principle in detail.

INTRODUCTION

Printed electronic technology combines the traditional printing technology and electronic technology, with specific optical and electrical properties of inorganic or organic functional materials and specific printing equipment to achieve the large-scale production of electronic components or semiconductor devices. With the development of printed electronic technology and printed electronic materials and printing electrons have been applied in various fields in the recent years.

However, there are still many problems to be solved, such as the existing printing electronic equipments are basically monochrome printing, two-color or multi-color overprint are still in the laboratory stage, due to the poor overprint accuracy. In view of this, the main purpose of the study is to solve the issues of multi-color printing and provide a new kind of method for printing electronic two-color printing.

THE DESIGN OF STRUCTURE

This paper presents a flattened two-color overlay printed electronic equipment from the main frame. The printing unit, the detection unit and drive control unit are divided into of four parts, the whole structure is shown in Figure 1.

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The Main Framework

The main structure of the entire equipment is contain the base, support frame, rail and its associated fixed components. The base has a hollow rectangular frame, which is located in the bottom of the entire equipment, to carry the entire equipment. A square support frame is installed in a direction of perpendicular to the base, and other parts such as a printing unit, a detection unit and a drive control unit are directly or indirectly placed on the support frame.

The base of the structure are respectively fixed with two guide rails and the supporting frame is connected with the base rail through the solid slide on the two sides of the base. A motor is placed at the middle of the front end of the base. The motor is connected with the screw rod through the coupling. The screw rod runs through the base and the terminal end is fixed at the rear end of the base. The support frame is connected to the lead screw through a slider at the center of its bottom. Thus, the support frame can reciprocate in the horizontal direction along the guide rail on the base.

The Printing Unit

Printing unit is the main mechanical component of the entire equipment, including the impression cylinder, squeegee, tension sensor, T-shaped chute, plates and manual adjustment knobs, etc. Among of them the impression cylinder is located above the base, both side shafts are mounted on the wall panel and one side shaft is connected with the motor which is installed on the vertical plate of the support frame through the coupling and the motor drives the impression cylinder to do circumferential movement. An S-shaped pressure sensor is mounted between the wall and the inverted L-shaped member. The top of the inverted L-shaped member is fixed with a hollow block which is connected to the motor at the top of the support frame by a lead screw and to the outside through a T-shaped slider to a T-shaped guide rail on the inside of the support frame. In this way, the two motors at the top of the support frame can be driven by the lead screw to finally move the
impression cylinder up and down in the vertical direction along the T-shaped guide rail and even the diagonal adjustment of the impression cylinder can be realized.

The impression cylinder is made of a composite material on which a flexible material for overprinting is installed such as paper, plastic, etc. Two squeegees are arranged symmetrically with the impression cylinder as the center, which is perpendicular to the plate, with the connecting rod fixed to the wallboard and to ensure that the ink distribution on printing plate.

The plates are two rectangular cubes. The printing plate is fixed on the base by a screws and has a gap with the impression cylinder, and the front edge of the printing plate is marked with a symbol "+" as the detection mark.

In addition, a printing plate adjustment knob is fixed to the outside of the printing plate and is screwed to the outer edge of the base. By rotating the plate adjustment knob, the printing plate can be pushed in a direction perpendicular to the direction of movement of said impression cylinder.

Detection Unit

The detection unit is also known as sensor detection unit. It consists three parts, one for the pressure sensor, the upper end of the supporting frame on the horizontal side of the motor through the screw connected to the lower end of the wall with fixed printing cylinder wall. A pressure sensor is arranged on the left and right wall plates for detecting the pressure between the roller and the printing plate. The pressure value is adjusted by a stepping motor mounted on the bracket beam. The second one is the coding sensor which is mounted on the impression cylinder shaft end to detect the angle of the rotation of the impression cylinder. The third one is camera, which is mounted on the upper horizontal plate of the support frame, the lens facing plate is convenient for collecting the printing plate. According to the collected image information, the drive control system of the equipment determines whether the relative position between the printing plate and the impression cylinder needs to be adjusted to ensure the quality of the printed product.

Drive Control Unit

The drive control unit is constituted by the equipment drive controller and the stepping motors. The drive controller controls the relative movement of the support frame and the impression cylinder by controlling the corresponding stepping motor, and adjust the pressure between the impression cylinder and the plate, the specific working principle is described in the following sections with detail.

THE PRINCIPLE OF CONTROL

The printing electronic equipment adopts closed-loop control, comprehensively collects the image information and the pressure state information feedback between the impression cylinder and the printing plate and real-time adjusts the relative motion state between the support frame and the impression cylinder to realize the two-overprint, the specific control block diagram shown in Figure 2. Among of them, the motor at the front of the base named as the motor 1 and motor 2, which is supporting the side surface of the frame and the last one is motor 3, which support the two beams on the framework of the motor.
Before the input power applied to the Printed electronic equipment, first of all we should fixed two different plates which are plate 1 and plate 2. In the impression cylinder the printed material is to be installed. After power-on, the reset button is pressed and the drive controller initialize the detection unit, the motor, the support frame and the impression cylinder, etc. for the initial setting position.

Press the start button, the detection unit will be start the testing. First, the detection unit through the camera to collect the current plate 1 "cross" logo, drive controller image recognition to determine the printing plate 1 and the impression cylinder relative position deviation is set within the allowable deviation range, if the allowable deviation, The relative position between the printing plate 1 and the impression cylinder can be indirectly adjusted by adjusting the position of the support frame by the motor 1. Further, then the image information is collected again. If the relative position deviation between the printing plate 1 and the impression cylinder still does not meet the requirements, the adjustment is continued according to the latest image information and the cycle is repeated until the relative position deviation between the printing plate 1 and the roller is satisfactory.

Next, the drive controller rotates the impression cylinder through the motor 2 to the printing start position according to the information uploaded by the coding sensor.

Finally, the detection unit detects the pressure state between the current impression cylinder and the printing plate by the pressure sensor and uploads the pressure state information to the drive controller. Similarly, the drive controller according to the state information through the motor 3 closed-loop adjustment of the cylinder in the vertical direction of the position until the pressure state also meets the system requirements, this time using the motor mechanical locking device to lock the motor shaft to maintain printing. The process of printing pressure is unchanged.

The detection unit is detected, the equipment will start the printing work, the printing process in the conductive ink squeegee will be uniformly coated on the plate 1, while the real-time acquisition of the plate and impression cylinder relative position information, drive controller based on location Information to determine whether or not printing plate 1 is finished. When the printing plate 1 is printed, the apparatus is returned to the initial state, and the detection unit go back to the detection state again and repeats the operation until the printing of the printing plate 2 is completed. At this point, two-color printing of electronic equipment to complete overprint.
CONCLUSION

This paper describes a circular flattened two-color overprint printing electronic equipment can achieve gravure, offset, flexographic printing, has a position and pressure self-detection function which can ensure the quality of embossing, printing electronic equipment, multi-color printing. The research has important guiding and popularizing significance.

REFERENCES