Design of Simulated Circuits for the Releasing Device Tester

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**Abstract.** Aiming at the function test of the releasing device, the encoding circuit was designed by using circuit simulation method, and the full function test of the device was realized by generating analog signals. The timing circuit, power control circuit and band switch circuit were designed by using sequential logic and micro processing technology, and the portable test device for the placement device was designed and implemented. The test results show that the performance of the tester is stable, the test items are complete, and the indicators meet the design requirements.

**Introduction**

In recent years, with the improvement of scientific and technological level and the renewal of weapons and equipment, supporting test equipment has also made considerable development. Since the 1950s, the research of test equipment has developed to the same important stage as equipment. At present, military departments and civil aviation in various countries have invested a lot of manpower, material and financial resources to develop and develop test equipment, and it is widely used in maintenance work. Compared with foreign countries, domestic test equipment research started late, but the development speed is faster. A series of research results have been achieved in bus test, virtual instrument, integrated test and fault diagnosis. However, the task of maintenance and support of equipment puts forward higher requirements for the miniaturization, portability and integration of test equipment. Aiming at the test requirements of test devices, this paper develops a portable test device for test devices. Using circuit function simulation, photoelectric isolation, high-speed display and other technologies, the functional test, fault diagnosis and comprehensive display of test devices are designed and implemented.

**Functional Requirement Analysis of the Tester of the Releasing Device**

The main function of the placement device is to send the specific DC timing pulse sequence of the placement to the electromagnetic transmission mechanism and to transmit the command of the preparation time of the projection. It includes two parts: the control table and the automatic device parts.

The tester is used to test the main technical characteristics of the dismantled throwing device and its unit components, and to assist in regular repairs. According to the basic functional characteristics of the device, the tester mainly completes the following functions:

- Sending the voltage to determine the continuity of the device to be tested.
- Receiving voltage pulse information, which is sent by the device to determine the time continuity.
- Receiving equipment performance information and power supply voltage information.
- Testing signal lamp integrity.
- Imitating speed and degree sensor signal.
- Complete the time automatic timing function.
- Complete the system self-check function.
Overall Design and Implementation of the Tester

According to the requirements of functional testing, the composition of the tester and the signal transmission diagram are designed, as shown in Figure 1.

Figure 1. Tester composition and signal transfer diagram.

Coding Simulation Circuit Design

Because the testing equipment mainly tests the performance of the placement device, the signals of each detection node of the placement device must be obtained under the "working" state of the placement device. When the equipment works, the tester sends out various instructions to drive the simulator to work, and provides corresponding analog signals to the device, so that the device is in the "working" state. The acquisition circuit sampled the signals of the test contacts of the device, sent them to the tester and output the test results.

Overall Design of Coding Simulation Circuit

The design of the encoding circuit is shown in Figure 2. The encoding circuit includes speed sensor encoding circuit and distance encoding circuit. The speed sensor encoding circuit generates four-bit binary speed code, and the distance encoding circuit generates five-bit binary interval distance code.

Figure 2. Simulated circuit design.
The pins 8, 9, 10 and 11 of plug S2 are speed codes 0, 1, 2 and 3 respectively. The 1000, 100, 10 and 11 bits of the speed code generation circuit are connected with the pins 8, 9, 10 and 11 of plug S2 respectively. The generated speed codes are input into the device. The pins 12, 13, 14, 15 and 16 of plug S2 are respectively the distance code 0, 1, 2, 3 and 4. The number of 10, 100, 10000 and 10000 bits of the distance code generation circuit are connected with the pins 12, 13, 14, 15 and 16 of plug S2 respectively, and the generated distance code is input into the placement device. The pin 4 of plug S5 is connected with pin 32 of plug S4 to provide 400 Hz 115V power supply voltage for speed code generation circuit and distance code generation circuit.

**Design of Interval Distance Coding Circuit**

Five-bit binary distance interval coding circuit is shown in Figure 3. When the band switch B3-1 reaches "3" gear, the diodes D22 and D32 are turned on, S2-12 and S2-13 are high level 1, the others are low level 0, and the output code is 00011, that is, the distance between "5m" is coded as 00011.

![Interval distance coding circuit](image)

**Design of Speed Coding Circuit**

The principle of four-bit binary speed coding is similar to that of five-bit binary speed coding circuit. Switch B2 is made up of "1", "2"... "12" and other 12-band switches, band switch "1" is "automatic" gear, "2" is "fixed" gear, and so on. S2-8, S2-9, S2-10 and S2-11 are four-bit output terminals. When the diode is switched on, the output terminal is high level 1, otherwise it is low level 0. For example, when the band switch reaches the "8" level, the diodes D8, D13, D18 are turned on, S2-8, S2-9, S2-10 are high level 1, S2-11 is low level 0, and the output code is 0111, that is, the speed is coded 0111.

**Power Supply Control Circuit Design**

The power control circuit design is shown in Figure 4. Plug S5-2 and S5-1 are connected to the positive phase of 27V and 115V voltage power supply respectively, providing 27V pulse voltage and 400Hz 115V power supply voltage for the circuit.

The insertion pin S5-3 connects to the shell end of - 27V (or grounding) to ensure that the equipment is in a safe state when leakage occurs. When SA1-1 is switched on, the S5-2 and S5-3 pins and 27V # lamp form a circuit. The 27V # lamp lights up and fuse FU1 is connected in the circuit to ensure the safety of the circuit when the current is too large.

The needle S4-30 is connected to the 115V negative phase end. When the switch SA2-1 is turned on, the pins S5-1 and S4-30 form a loop. When SA2-2 is switched on, the pins S5-1 and 115V # lights and the earth form a loop, and the 115V # lights are on. In order to ensure the safety of the circuit when the current is too large, Fuse FU2 is connected to the circuit.
Conclusion

In this paper, the coding circuit is designed by circuit analog simulation method. The full-function test of the device is realized by generating analog signals. The timing circuit, power control circuit and band switch circuit are designed by using sequential logic technology. The portable test device for the placement device is designed and implemented. The functional test shows that the test device has stable performance, the test items are complete and the indexes are in line with design requirements.

References


