

Research on High Speed Rotating Control Machine of Fuze

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Abstract. High speed rotating control machine of fuze can use high speed motor produce effect of rotating centrifugal force under the laboratory environment to simulate the centrifugal force that the fuze received in the flight. The equipment can give a rotating test for the fuze to check its security and dependability.

1. Introduction

Ammunition is an important component of weapons and equipment, and the terminal subject of the target destroyed by the combat system. As a device to control the action of projectile, fuze is the key component of ammunition and the weak link of the whole projectile life. With the increasing quantity of ammunition equipment and the increase of storage time, the quality of fuze in storage state is bound to change due to the influence of environmental stress. As a detonation control system, the fuze must be in a safe state within a certain distance from the storage, transportation, handling and preparation before launching. At the same time, it is necessary to ensure a reliable role in a predetermined position. The main function of fuze is the safety mechanism, one of which is the centrifugal insurance device.

The fuze high-speed rotary control machine is mainly used in the laboratory to simulate accurately the centrifugal force of the fuze in the rotating environment during the ballistic flight through the centrifugal force generated by the high-speed motor rotating. The fuze is mounted on the rotating connection head of the high-speed motor. According to the requirements of the test method, the rotating speed, acceleration time, constant speed time and deceleration time are required to carry out the rotating test on the sample. Check the safety and reliability of various mechanisms driven by centrifugal force in fuze.

2. Equipment Construction

The fuze high speed rotary control machine is composed of two parts: rotating test bed and operation console. It mainly includes: rotating transmission system, measuring control system, cooling water circulating system, braking system and safety protection system.

As the carrier of fuze, rotary transmission system can simulate the centrifugal environment of fuze vividly by changing the speed of rotation.

The measurement control system consists of manual control system, computer control system, frequency converter and sensor. During the test, the test parameters are set on the manual control system interface (or computer control interface). At the same time, the speed of the high speed motor is changed with the frequency of the output of the frequency converter. At the same time, the photoelectric sensor (photoelectric switch) detects the speed of the high speed motor, and transmits the test result back to the control system. The system controls the rotational speed error, realizes the tracking control of the speed, and completes the rotating test task of the fuze.

The cooling water circulation system consists of cooling water box, cooling pump and water flow switch, which is used to cool the high speed motor when it rotates and plays a protective role to the high speed motor. The water flow switch is connected with the outlet of the high speed motor. Ensure monitoring of cooling water cycle in motor.

The brake system is mainly composed of brake handle, brake ring and brake stroke switch. The brake system is installed in the console for installation and disassembly of test samples and fuze connectors.

The safety protection system is designed with penetrating energy absorption structure to achieve the purpose of explosive fragment protection and detonation venting of fuze, and play the role of safety protection of personnel and equipment.

3. Operational Principle

The working mechanism is shown in Fig 1.

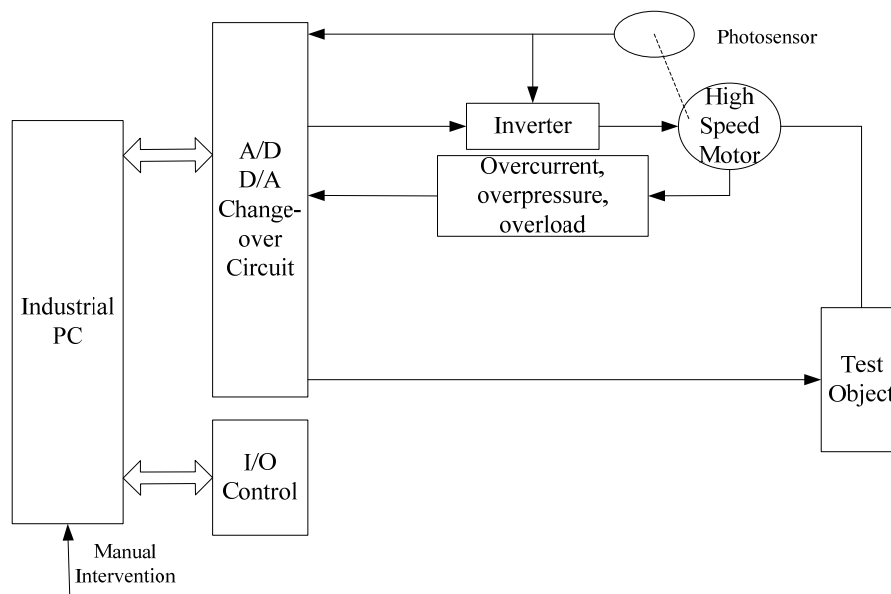


Fig. 1 Working principle

Through the computer control system (or the liquid crystal manual control system), the set parameters of the rotation test are transmitted to the control register by instruction, and then to the main microprocessor of the measuring and controlling circuit. At the same time, the signal channel sends out the operation instruction to the frequency converter I or the converter II, which drives the motor I or the motor II to run. The actual running state information of the motor is fed back to the computer through the photoelectric sensor measurement and control system, and the real-time operation monitoring is achieved.

Speed monitoring signals, water failure monitoring signals, protective cover monitoring signals and motor overload and other fault signals are also fed back to the computer terminal through the same signal channels to facilitate effective monitoring by operators. Modify and control motor operation.

The motor speed limit speed protection circuit, under the setting of the parameters of the motor speed range, the control register does not execute this command, which protects the high speed motor.

When the acceleration and deceleration time of each speed stage is less than the fixed value of the system, the system will not perform the test and set the parameters to run according to the fixed parameters of the system, so that the safety of the equipment will not be affected by the missetting of the parameters. The intelligent level of rotating test system is improved.

4. Equipment Using

4.1 Operation of Manual Control System

The operation of the manual control system is shown in Fig 2.

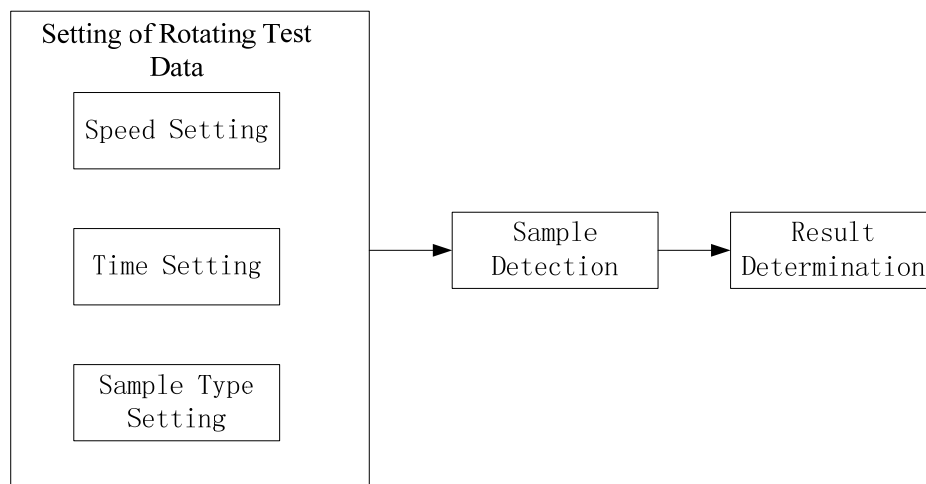


Fig. 2 Operation diagram of manual control system

Rotation test data setting. After the equipment is connected to the power supply, the control steering switch on the rotating console is switched to the manual control system, and the high-speed motor is selected according to the requirements of the fuze test method, and the rotating test data (detection speed, acceleration time, deceleration time, etc.). When you need to change any of the parameters you set, press the cancel button to remove it and then reset it.

Sample detection. After the parameter setting, the system returns to the parameter setting interface, and the prompt appears in the lower left corner of the screen. At the same time, it can check whether the set parameter is correct or not, if not correct, it can be modified by "cancel" key. If the correct press "OK" button to confirm, then the control system to the inverter issued instructions, after the command by pressing "OK" motor to start operation, the sample began to detect. After the acceleration is over, the constant speed time begins to count down; after the constant speed end, the deceleration time starts to count down; at the same time, the actual rotation speed of the high speed motor is shown.

The manual control system has the function of memory. It can remember the test parameters set at the last time. In the case of no power failure, if the sample is detected in the same batch, after the first sample has been tested, without changing the parameters, Can no longer be set parameters, direct selection of "OK", can be the next sample test.

4.2 Operation of Computer Control System

First, the computer is connected with the communication interface on the rotating console, the power supply is connected, and the control steering switch on the rotating console is switched to the computer operation control system to run the "Fuze High Speed Rotary Control Machine Measurement and Control Software".

System self-test. The self-inspection system is mainly properly on the communication system, high speed motor cooling system is normal and other security measures to protect the safety of self, the main role of high-speed motor work, equipment to work must carry out the system self-test, if the first boot device by self, in the equipment power conditions on the sample test do not need to carry out self-inspection.

Sample detection. Sample detection mainly includes sample information input, modification, setting of test parameters, monitoring of the detection process and filling in the test results.

The input of sample information means that the sample information needed to be rotated test can be input into the sample information database at one time, and the sample information can be modified, and the sample can be selected from the sample information base during the rotation test. When you need to test the next batch sample, return to the sample entry interface and repeat the operation.

5. Conclusion

The high speed fuze rotary control machine adopts integrated and redundant design, which effectively ensures the accuracy, reliability and safety of fuze performance testing when it is rotating

at high speed, and adopts flexible vibration and noise reduction technology to solve the problem of fuze rotation at high speed. In eccentric environment, the problems of noise and vibration are produced when the performance is tested, and the harm of noise and vibration is reduced. By using advanced techniques such as photoelectric sensing and computer measurement and control, the rotating speed of the equipment can be adjusted by itself. The test precision and intelligence level of fuze centrifugal performance test are improved, and the fuze straightening can be carried out by changing the equipment, not only for conventional centrifugal rotation test, but also for multi-purpose fuze test. The test of line inertial force improves the efficiency and scope of the testing equipment. The design idea is novel, the application technology is advanced, the system is simple to operate, the speed of speed is accurate, and it has the characteristics of intelligence, modularization and miniaturization. The key and difficult problems in ammunition performance test are solved, which provides a scientific way and method for fuze performance testing, and has great military economic benefits.

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