AS100 Frequency Converter for CNC Cutter

Bearing cutter is a piece of small to medium-sized equipment for producing bearings. It is used to cut the bearing inner ring and outer ring out of bar stocks. The cutting process is pictured below.

Bar Stock　　Cutting　　Bearing Inner (Outer) Ring

Fig. 1　Cutting of Bearing Inner and Outer Rings

This CNC cutter pictured above adopts 2 servo systems, each with an output power of 750W and responsible for feeding raw materials along the X- and Y-axis respectively.

Working Principle

The electrical system of the CNC cutter is made up of the PLC, touch screen, servo system, electrically controlled hydraulic pump, frequency converter, and the stepped motor. The PLC is responsible for control of the whole electrical system. Via the touch screen, users can input the cutting length and error compensation value. The servo system is used to detect the starting point of the cutter while the electrically controlled hydraulic pump provides the power for feeding bar stocks into the cutter. During cutting, the steel tube is rotated by the primary motor while at the same a secondary motor is used to perform cuts on that tube. The function of our frequency converter is to control the speed of the primary motor. The converter panel is wired directly to the control panel. Thus users can operate the converter via rotating the knob on the control panel.

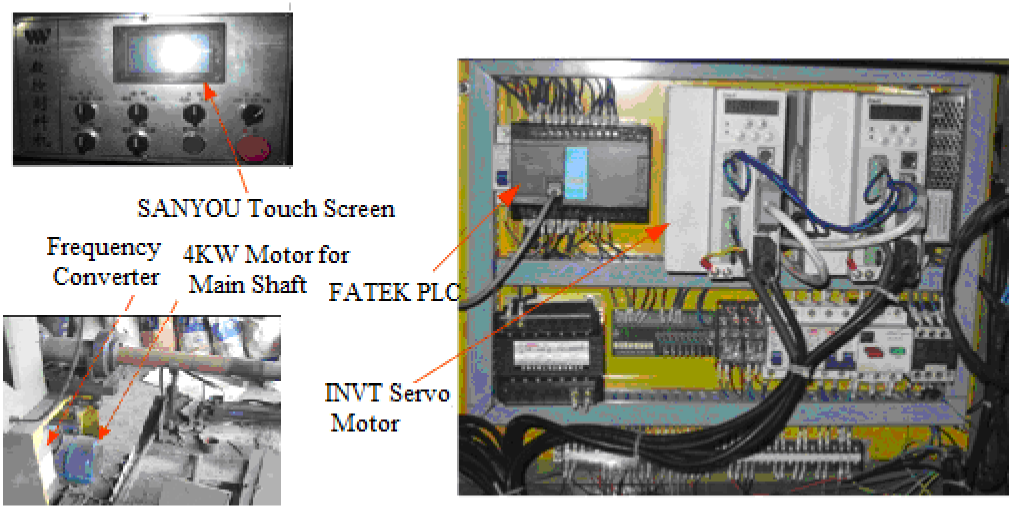

Fig. 2 Electrical System of CNC Cutter

The servo system operates at the position mode. It is controlled by the PLC via pulses and directions. The PLC adopts the OC output. Connections between different parts of the electrical system are listed in Fig. 3. Please refer to Table 1 for connections between the servo system and PLC.

PLC	X-Axis Drive CN2	Y-Axis Drive CN2
+24V	13,47	13,47
COM	40	40
Y0	8	
Y1	12	
Y2		8
Y3		12

Table 1

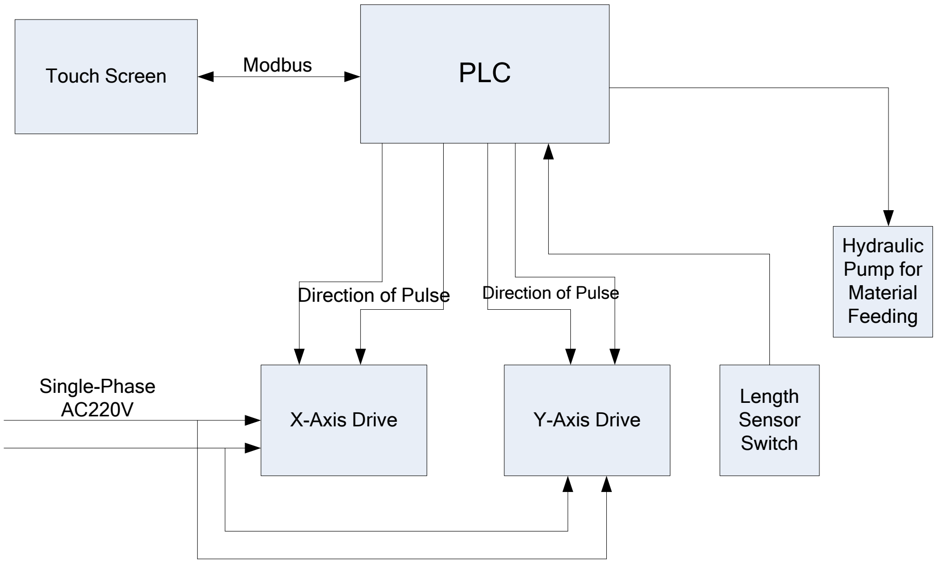

Fig. 3 Connections between Different Parts of the Electrical System

Fig. 4 System Arrangement

Commissioning

Once the assembly of the electrical system is completed, users first need to carry out inch movement tests on the system. This is to make sure the servo system functions normally and the direction of rotation is alright. Such tests should be performed both on the X- and Y-axis servo systems and eliminate any wiring problems if there is any.

After the test, start the cutter and work the steel tube with it. It is recommended to set the gain value of the drive at its maximum level so that the drive can respond to orders in the fastest possible time. The position proportion gain value should be at 280, speed proportion gain value at 200, and speed integral time is at 10. Once the adjustment is done, users can start up the cutter for cutting 20-30 bearing rings with it. Then stop the machine and check the finished parts to see whether there is good repeatability and high dimensional accuracy. If not, re-adjust the gain values and test the cutter once again.

If the cutting precision and repeatability still can not meet the requirements after a few times of adjustment, users should begin to check the transmission system. It is not unlikely that there should be problems with the lead-screw especially after a long time of tests. Reset the speed proportion gain value to 250, the integral time to 5 and the electric current proportion gain value to 220. Analyze the production processes. In fact, the Y-axis should be a major consideration when there are cutting accuracy and repeatability problems. If such is the case, users should set the electric current proportion value and speed proportion value higher while maintaining a moderate position proportion gain value. Via this adjustment, the cutting stability and servo system response time can be improved. After adjustment, users can use the cutter to make another 20 bearing rings to check the cutting precision and repeatability. There are times when cutting errors accumulate as the cutting process goes on. In that, users should raise the feed forward value from 40 to 50.

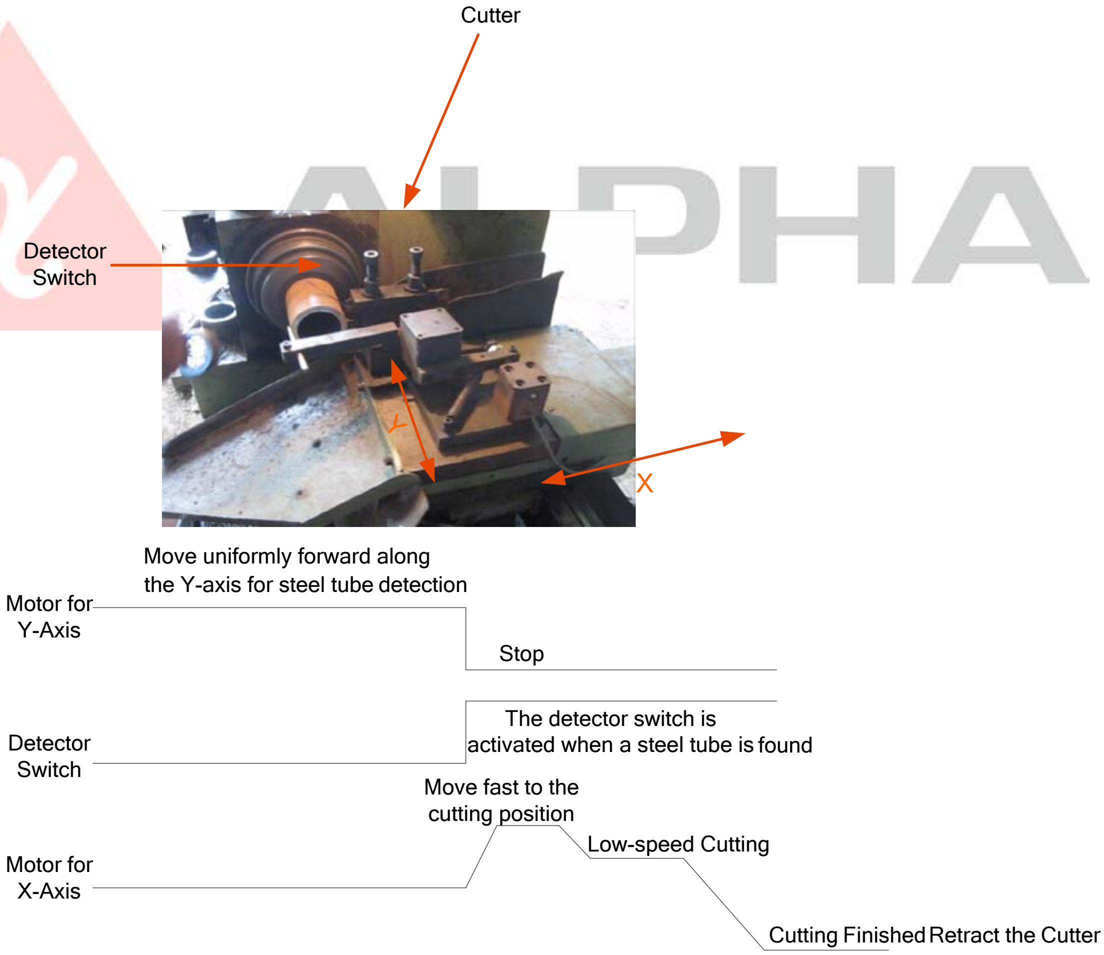

Fig.5 Process Flow Diagram