

Research on Quick Sizing System

Lu Jinming^{1,a}

¹Jiangsu College of Engineering and Technology, Nantong, Jiangsu 226007, China

^amashunbin@163.com

Key words: quick sizing system; creel mechanism; sizing mechanism; drying mechanism; winding mechanism; temperature-controlling mechanism

Abstract: Quick sizing system composed by creel mechanism, sizing mechanism, drying mechanism, winding mechanism and temperature-controlling mechanism. The four notes are put forward. Using this quick sizing system for JC20^S, the yarns are tested before and after sizing. The results show that: after sizing, breaking strength, elongation at break of yarn is improved, can conform to the requirements of weaving completely.

Introduction

With the rapid development of modern textile industry, the requirements of hand-made samples become increasingly higher.[1] Face with a massive amount of hand-made samples, if designers sizing by conventional method, this results in long time and high cost.[2-3] So quick sizing system is designed for sizing of warp yarn, The results show that: quick sizing system can improve the samples rate and quality, it has obvious effect to reduce costs also.

Design Quick Sizing System

Quick sizing system composed by creel mechanism, sizing mechanism, drying mechanism, winding mechanism and temperature-controlling mechanism.

Creel Mechanism

Its function is to hold the supply packages in a manner so as to facilitate warping. Yarns in the form of a cone will need sizing are put on the bracket, then yarns have been through the spring disc type tension device in turn, guide hole into the sizing mechanism, and the yarn sizing tension can be achieved by adjusting the spring of elastic, in order to avoid excessive wet elongation and loss of elastic yarn, the tension try to smaller, which ensures the bobbin forming. [4]

Sizing Mechanism

Sizing mechanism is composed by stainless steel sizing-slot, immersing roller and starched mechanism, sizing mechanism is shown in Figure 1.

Sizing mechanism has not sizing roller and squeezing roller, instead of setting up the starched mechanism, starched mechanism is composed by stainless steel disc and sponge. Excess size on surface of yarn is removed when yarn passes through sponge, starched effect can be adjusted by spring at the back of stainless steel disc.

Drying mechanism

Drying mechanism is composed by heating mechanism, yarn feeding mechanism and heat-off mechanism. Drying mechanism is shown in Figure 2.

Heating mechanism is composed by three 1000 watts electrothermal pipes side by side. In the beginning, three electrothermal pipes heat at the same time, when reach the predetermined temperature, three electrothermal pipes stop heating, the chamber temperature is controlled by temperature control institutions, when the temperature is lower than the preset temperature, the

middle electrothermal pipe heat, heat preservation, the both sides of electrothermal pipe stop working.

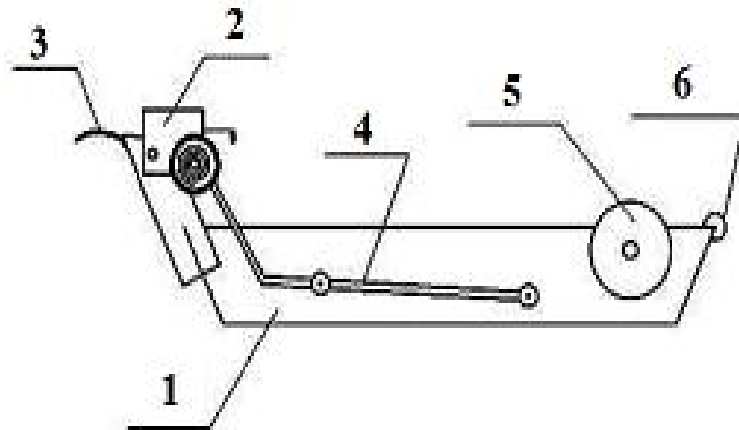


Figure 1 sizing mechanism

- 1- stainless steel sizing-slot 2- extruded bar 3- hand shank
- 4- rod 5- sponge 6- gasket

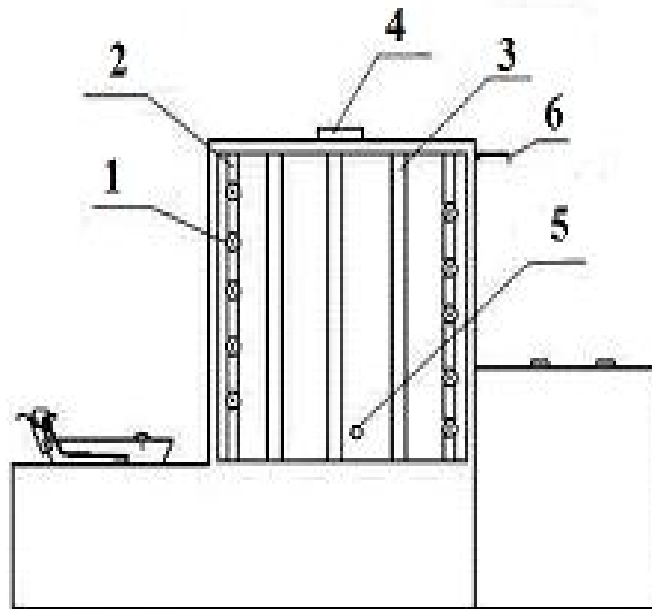


Figure 2 drying mechanism

- 1- guide wheel 2- vertical support 3- electrothermal pipe 4- exhaust fan
- 5- temperature sensor 6- strip elastic piece

Yarn feeding mechanism is composed by vertical support and guide wheel, two vertical supports are installed in the chamber, each vertical support is equipped with five guide wheel, yarn dried quickly when yarn passes through the chamber.

Heat-off mechanism is composed by exhaust fan. In the drying process, a lot of water vapor is left in the chamber, the humidity in the chamber is high, the humidity affect the efficiency of drying, so equip a exhaust fan on the top of the chamber, exhaust fan excludes the humidity out.

In order to avoid outside surface temperature of the chamber is too high, a set of heat insulation device is fitted in the chamber.

The chamber is composed of double tin, about 2-3 mm from the outer layer of tin, we added the heat insulation asbestos board, asbestos cloth of insulating layer, the insulating layer 2-3 mm distance, is the inner chamber tin, formed the outer tin - insulating layer, layer of insulating layer-tin

double air film, effectively prevent the heat convection and conduction, the heat insulation effect is ideal.

Temperature thermocouple detects temperature of chamber, and the detection results are passed to the temperature control mechanism. Temperature of chamber is controlled 60°C approximately, the temperature is too high, yarn brittle, and temperature is too low, the efficiency is too low.

Winding mechanism

Winding mechanism is composed by strip elastic piece and yarn cradle, strip elastic pieces are mainly used as a buffer role, when a sudden change in the sizing tension, strip elastic piece bends, which have the effect of equilibrium tension. Yarn cradles are mainly used as yarn storage, in fact, sizing speed is the operator reeling speed, about 20 m/min, operators should check moisture regain, feel is partial tide or partial dry, timely adjust the temperature of chamber.

Temperature-controlling mechanism

The working principle of temperature-controlling mechanism is shown in Figure 3.

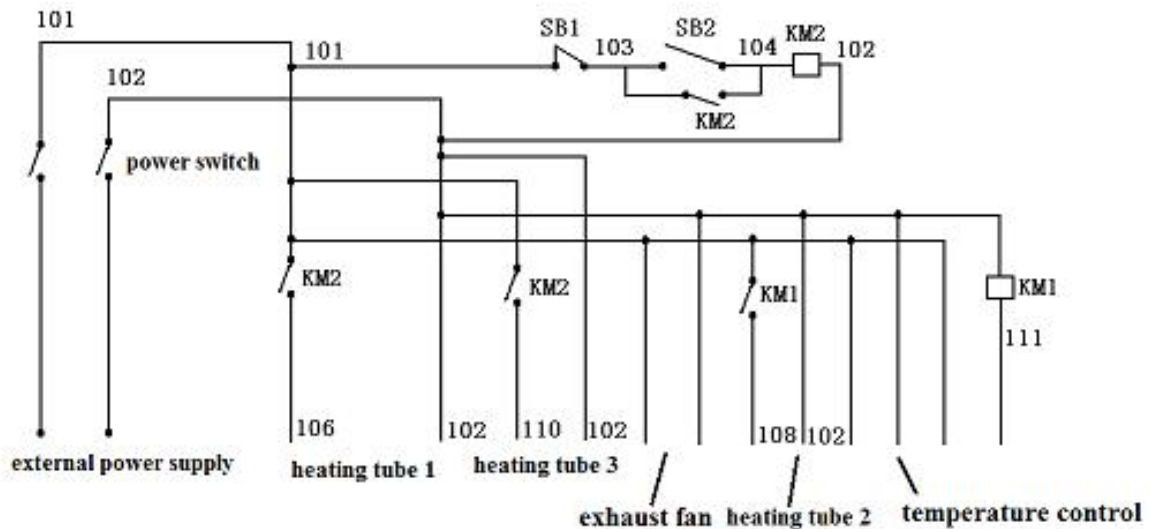


Figure 3 The working principle of temperature-controlling mechanism

Press the power switch, the coil of AC contactor KM1 is in an energized state, heating tube 2 pick up on the AC contactor KM1 start heating; and then press the switch SB2, the coil of AC contactor KM2 is in an energized state, heating tube 1 and heating tube 3 start heating;

In the circuit with the thermostat, prior to the chamber of the preset temperature, thermocouple into temperature of chamber detection of the thermostat, on the other side pick up on the terminal 1 and 2 of the thermostat, with the gradual rise of temperature of chamber, when rose to a preset temperature, thermostat always low line cut off, the coil of AC contactor KM1 is cut off, heating tube 2 stop heating, at the same time, by hand press switch SB1, the coil of AC contactor KM2 is cut off, heating tube 1 and heating tube 3 stop heating; However, heating tubes have excess heat, the temperature of chamber continues to rise, open the chamber door to clear heat, make the temperature of chamber back to the preset temperature, when the temperature of chamber down to the preset temperature below 1°C, under the control of the temperature controller, the coil of AC contactor KM1 is in an energized state, heating tube 2 start heating, heating tube 2 stop heating when temperature reaches the preset temperature, use excess heat to heat preservation, in the sizing process, in order to achieve the best temperature drying, the temperature of chamber is always control within the preset temperature, temperature will move up and down in a limited range.[5]

Sizing effects

Sizing Formula: PVA1799 35g, JSL-2 35g, water 1000ml, Solid ratio of sizing agent is 7.0%。the performances of JC20^s are tested before and after sizing, the performances of JC20^s before and after sizing shown in Table 1.

Table 1 the performances of JC20^s before and after sizing

	before sizing	after sizing
breaking strength/cN	390.1	550.50
breaking strength CV/%	6.48	5.28
elongation at break/%	7.15	4.14
elongation at break CV%	4.98	6.20

The results show that: after sizing, breaking strength, elongation at break of yarn is improved, can conform to the requirements of weaving completely.

Conclusions

(1) Heat insulation layer is separated from tin, chamber is heated to 60°C, lasts 40 minutes, surface temperature of chamber is only high 4°C than normal room temperature.

(2) Operators should check moisture regain, feel is partial tide or partial dry, timely adjust the temperature of chamber.

(3) Starched mechanisms should clean timely after use, otherwise sponge starched effect will be lost after sizing agent is natural drying.

(4) Solid ratio of sizing agent can't big, with 5%~7%.

References

- [1]Fu Daodan. Study on optimization of a textile factory total quality management system based on the theory of three [D].Hubei: Xiangtan University, 2014.
- [2]Meng Hongcai. Problems should be paid attention to in sizing production[J]. Cotton Textile Technology, 2014, 42 (9) : 6-10.
- [3] Zhao Shaixi, Zhou Daming. Application of pre-wet sizing in cotton poplin fabric [J]Shanghai Textile Science & Technology, 2009, 37 (12) : 29-30, 48
- [4] An Baiqin, Wang Ruiqing, Leng Zhaole, Xu Jinsheng. Development of Superfine Count High Density Satin Drill[J]. Cotton Textile Technology, 2013, 41 (10) : 59-61
- [5] Liu Hao. Design and Experimental Research on Electric Heating Temperature Control System[D].Zhejiang: China Jiliang University,2012.