Automatic Yarn Breakage Identification Warping Machine By Using PLC

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Abstract- The sectional warping machine is used for preparation of multi colored warps to be woven as striped of checked design fabrics. It is also used for doubled grey or mono-colored warps that do not require sizing. Unlike the beam or direct warping where a warp beam is produced that is sent to the subsequent sizing processes, in the case of sectional warping, the weaver's beam is produced and hence does not require sizing. In the case of single yarns that are multi colored, the yarns are sized and then wound on the sectional warp beam. The yarn is wound in sections, each section having a particular width. Thus the total number of warp ends for the weaver's beam is divided into suitable number of sections on a warping drum. The sections are then combined to form the weavers beam. Therefore, there are two distinct operations involved, namely, warping and beaming .After the market Feedback we found that The Main & Common Problem Is The Sectional Warping Machine's Power Consumption is too High. So We have to solve this problem with reduce the time of one full cycle of Beamer.

I. INTRODUCTION

An automatic warping machine is a type of machine used in the textile industry to prepare the warp yarn for weaving. It involves the process of winding the yarn onto a beam in a predetermined pattern and tension .The automatic warping machine can be controlled by a programmable logic controller (PLC), which is a digital computer used to control various industrial processes. The use of a PLC in the automatic warping machine provides many advantages such as increased reliability, flexibility, and ease of programming .The PLC can be programmed to control the speed of the machine, the tension of the yarn, the length of the warp, and the pattern of the yarn tension sensor, the beam diameter sensor, and the speed sensor .With the use of a PLC, the automatic warping machine can operate more efficiently and accurately, with less human intervention. It can also reduce the risk of errors and increase productivity .Overall, the introduction of an automatic warping machine using a PLC provides a modern and efficient solution for the textile industry, helping to improve the quality of the final product while reducing production costs.

II. MOTIVATION TOWARDS THE WORK

In addition to improving efficiency and productivity, the use of automatic warping machines also helps to reduce the overall costs of textile production. By streamlining the warping process, manufacturers can save time and resources, ultimately resulting in cost savings that can be passed on to customers. Overall, the motivation towards the work of automatic warping machines is to improve the efficiency, productivity, and quality of the textile production process, while also reducing costs and minimizing errors.

III. OBJECTIVE OF THE PROJECT

❖ The objective of a PLC (Programmable Logic Controller) based automatic warping machine is to automate the process of warping yarn or thread onto a beam or spool for use in textile manufacturing. The PLC controls the various components of the machine, such as the creel, tensioners, and beam winder, to ensure that the yarn is wound evenly and at the desired tension.

❖ The benefits of using a PLC-based automatic warping machine include increased productivity, improved accuracy and consistency, reduced labor costs, and the ability to customize the process to meet specific manufacturing needs. The PLC can also monitor and control various aspects of the process, such as yarn tension and speed, to ensure that the finished product meets the desired quality standards.

❖ To Automating the process of measuring and cutting the warp yarns to the correct length, reducing the risk of human error and increasing accuracy.

IV. EXISTING SYSTEM

A warping machine is an essential piece of equipment used in textile manufacturing to prepare the yarn for weaving. The process of warping involves winding the yarn from multiple spools or cones onto a single beam in a specific pattern. The existing systems of warping machines can be broadly

categorized into three main types: hand-operated warping machines, semi-automatic warping machines, and fully automatic warping machines. Hand-operated warping machines: These machines are manually operated and are suitable for small-scale textile production. They consist of a creel, a warping drum, and a ratchet wheel. The operator manually winds the yarn onto the drum, which rotates as the ratchet wheel is turned. Hand-operated warping machines are simple and low-cost but require a high level of operator skill to produce consistent warps.
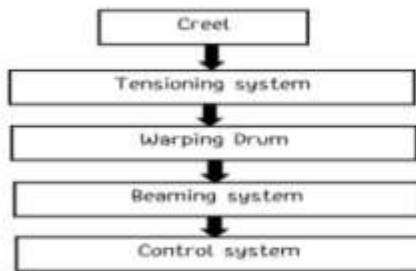

Fig.2 Block diagram of proposed system

Fig.1 Block diagram of existing system

V. PROPOSED SYSTEM

In Sensors: Sensors are used to detect the various parameters of the warping process such as the tension, speed, and position of the yarn. Examples of sensors used in a warping machine include proximity sensors, photoelectric sensors, and encoder sensors. Actuators: Actuators are used to control the various stages of the warping process. Examples of actuators used in a warping machine include motors, solenoids, and pneumatic cylinders. PLC: The PLC is the central controller of the automation system. It receives input signals from the sensors and sends output signals to the actuators to control the various stages of the warping process. The PLC also stores the program that defines the sequence of operations for the warping machine. HMI: A Human Machine Interface (HMI) is used to provide a graphical user interface for the operator to interact with the warping machine. The HMI displays information such as the status of the machine, the progress of the warping process, and any error messages. Control Algorithm: The control algorithm is the program that runs on the PLC and defines the sequence of operations for the warping machine. The control algorithm typically includes logic to control the tension, speed, and position of the yarn during the warping process. .Creel System: The creel system is responsible for holding the yarn cones and feeding the yarn to the machine. The creel system consists of multiple levels, each level holding several cones of yarn. Beaming System: The beaming system is responsible for winding the yarn onto the warp beam. The beaming system consists of a beam and a creel, which are connected by a shaft. The yarn is wound onto the beam by rotating the shaft. Safety System: The safety system ensures that the machine operates safely. The safety system includes emergency stop buttons, safety interlocks, and other safety features.
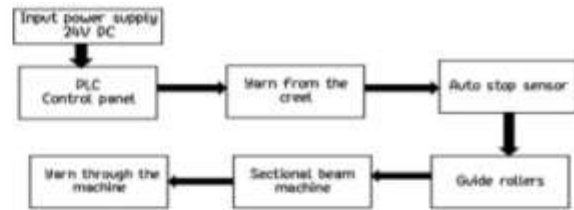
ALLEN BRADLEY PLC

Allen-Bradley is a brand of programmable logic controllers (PLCs) manufactured by Rockwell Automation. Allen-Bradley PLCs are widely used in industrial automation applications and are known for their reliability and flexibility. The Allen-Bradley PLCs come in various series, including the ControlLogix, CompactLogix, MicroLogix, and PLC-5 families. These PLCs are programmed using the Rockwell Software Studio 5000 environment, which is a common platform for developing, configuring, and maintaining the controllers. Allen-Bradley PLCs are designed to control a wide range of automation processes, such as controlling assembly lines, managing industrial machinery, and managing complex processes such as oil refining, food and beverage processing, and energy management. The company also offers a wide range of accessories and add-ons, such as sensors, HMI displays, and I/O modules, that allow the PLCs to be customized to specific applications.

Fig.3 AB PLC

SWITCHED MODE POWER SUPPLY (SMPS)

A switched-mode power supply is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently. Like other power supplies, an SMPS transfers power from a DC or AC source to DC loads, such as a personal computer, while converting voltage and current characteristics.

Fig.3 SMPS

MINIATURE CIRCUIT BREAKER

MCB is an automatic switch that opens when excessive current flows through the circuit. It can be reclosed without any manual replacement. In case of a fuse, once it has been operated it must be replaced or rewired depending on the type of the MCB. A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by excess current from an overload or short circuit. Its basic function is to interrupt current flow after a flaut is detected.

Fig.4 MCB

PLC CONTROL PANEL

In the context of Programmable Logic Controllers (PLCs), a control panel serves as a central location for controlling and monitoring the PLC system. The control panel provides an interface for the operator to interact with the PLC and perform various functions such as system configuration, program uploading and downloading, and system monitoring. Here are some common uses of the control panel in PLC. System configuration: The control panel allows the operator to configure the PLC system, including setting up communication protocols, configuring input/output (I/O) modules, and configuring system parameters.

Fig.5 PLC CONTROL PANEL

CREEL

A creel is a frame or structure that holds a set of yarn bobbins or cones in a specific arrangement, which feeds the yarn into the warping machine for processing. The creel ensures that the yarn bobbins or cones are arranged in a specific order and orientation, which is essential for creating a uniform warp for the textile. This helps to ensure consistent tension and density of the yarn during the warping process. The creel provides a convenient way to feed the yarn into the warping machine, which helps to reduce tangles and other problems that can occur when handling large quantities of yarn.

Fig.6 CREEL

AUTO STOP SENSOR

The main function of the warp stop motion is to detect breaks of the warp yarns. If a break of any warp yarn is detected, the weaving machine stops immediately. The device used is called warp stop motion; it stops the running of the weaving machine at each thread breakage or even when the thread becomes slack, that is when the thread gets a tension level considerably below normal level. Stop motion sensors are used when yarn breaks.
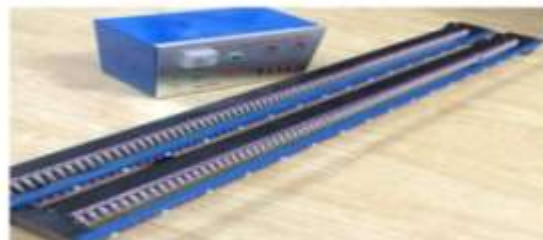

Fig.7 AUTO STOP SENSOR

ADVANTAGES

- ❖ Human instrusions are minimized
- ❖ Gives more accuracy, works continuously, gives consistency
- ❖ Maintenance is minimized
- ❖ Ladder logic is easy to implement and troubleshoot

VI. RESULTS

Fig.8 SECTIONAL WARPING MACHINE

VII. CONCLUSION

In conclusion, a PLC (Programmable Logic Controller) based automation warping machine offers several benefits such as increased productivity, improved efficiency, and better quality control. By automating the warping process, it reduces the reliance on manual labor and ensures consistent and accurate results. PLC-based automation warping machines are easy to program, operate, and maintain. They can also be easily integrated with other factory automation systems to streamline the production process. Additionally, PLC-based automation warping machines offer real-time monitoring and reporting, allowing operators to detect and correct any issues before they become major problems.

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