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A Review Paper on Silk Winding Machine

Akash S Gavhane[1], Pramod Gavhane[2], Sagar Pekale[3], Manish Gulave[4], Prof. S.S.Chuadhari[5]

[1]BE Student, Mechanical, SND COE & RC, Yeola, Maharashtra, India
[2]BE Student, Mechanical, SND COE & RC, Yeola, Maharashtra, India
[3]BE Student, Mechanical, SND COE & RC, Yeola, Maharashtra, India
[4]BE Student, Mechanical, SND COE & RC, Yeola, Maharashtra, India
[5]Asst. Prof. Mechanical, SND COE & RC, Yeola, Maharashtra, India

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Abstract - *In India textile play a very important role. This is a very essential need among all other. The aim to design the silk winding machine is that to reduce the time for the winding of silk. The job of winding the silk is very tiresome. Also the time required for the winding varies largely from worker to worker, thus making process is time unpredictable. Our work lead to develop the silk winding machine, controlled electronically. This makes winding process of the silk convenient. The novelty of this machine is lies between, it makes use of a belt and pulley to guide the silk wound over the drum and cone. Groove drum having the groove in the different angle which will help to wound with ease and quick. The grooves are in standard size of 10", 20", and 30"and up to 70". The start angle of winding is effective on tightening of silk curvature and the wider start angle cause tighter curvature and more length of silk. Being mechanical engineer we just thought of making a machine which will make winding process of silk convenient.*

Keywords- Electronic Control, Cone Winding, Silk Winding, Precision Winding Etc.

1. INTRODUCTION

As India being a highly populated country, textile plays an important role in India. We can find number of small scale handloom machines in various cities of the country.

Maharashtra state is famous for 'Paithani' sarees. Huge amount of workers as well as money is involved in paithani saree making process. In cities like Paithan, Yeola paithani sarees are manufactured at home by the handloom workers, the manufacturing process of paithani saree involves –Dying, Loom, Winding and Weaving process.

Winding of silk is the most primary and important phase of this process. This job of winding silk is very tiresome and time consuming process.

In today's scenario winding process is carried out by skilled labor with the help of traditional instruments like 'ASARI' and tripods. The raw silk used to place on tripod made up of wooden sticks well finished with the wax on regular basics by the worker. The skilled labor turns asari by one hand and adjusting the yarn by the other hand.

The winding of silk thread is very tiresome job. The process is highly time-consuming and less precise. The process totally depends on skill of the labor. Also the time required for the winding varies largely from worker to worker thus making process time unpredictable.

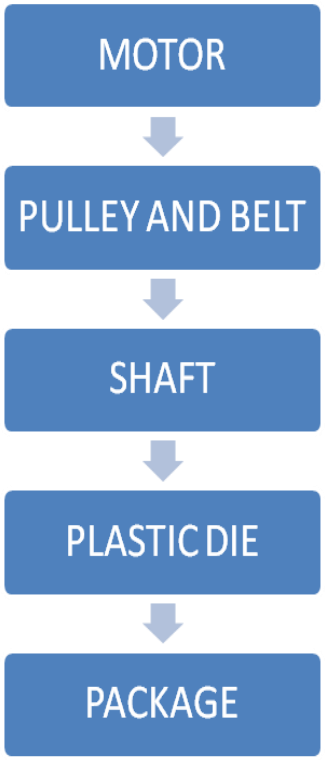

Fig.1. Power flow diagram

There are various types of silk winding machine available in the different textile industries, there machine based on the random, precision, step precision winding system. These machines are particularly fully automated and of high cost, which are not purchasable to the handloom worker. The need of handloom worker for household use or small industries is that to have a low cost silk winding machine.

2. LITERETURE REVIEW

There are lots of studies made for the yarn winding. M. sheikzadehet.al, determine the position of the yarn on the surface of the cone for random situations. They have also derived the parametrical equation of yarn curvature. The

results show the optimum position for winding. Heed that the wide start angle and tight cone angle cause the tight yarn curvature and the large length of the yarn on package, but these parameters are limited for winding process. This method can be applied to estimate the grooved drum curvature for the packages at various cone angles such combinations helps in getting constant cone angles during winding process, thereby giving more uniform and stable winding in downstream.[1]

M. Koranne et.al. Stated that the grooved drum winding system has been used on these machines over decades that have several limitations and rewinding of these packages may become essential to cater needs of some end user applications. The user can exploit capabilities of this system to produce a package on an automatic winding machine best suited for requirements of its end use. Also this system has wide scope for its further development. [2]

K.P. Chellamaniet al. Presented paper on Yarn quality improvement by using air jet assembly, they have designed an air-jet nozzle to decrease the hairiness of yarn and thereby improving the deterioration in the yarn quality. They have concluded that the use of air-jet helps to maintain evenness and imperfections. The hairs in the ring yarn decreased by the 50-75% also the use of air jet do not affect the average level of twist and its variation in the ring yarn [3].

Pragnya Sanjiv Kanade as mentioned earlier this will be a very effective way of overcoming the disadvantages of the mechanical method of changing the winding parameters. The acceleration and deceleration time involved is very less, so almost a linear traverse can be obtained along with a good lay, which is one, of the biggest advantages of the reciprocating system. It can also reduce the inventory cost, a since large number of gears or scroll cams will not be necessary. It will also be possible to wind packages with variable traverse ratios, lengths, and gain effortlessly. The most interesting development is that, the system can be operated on the precision as well as the semi-precision winding principle. The pressure drop obtained is slightly higher while testing the cartridges produced on fabricated winders, which is probably why they also show better micron rating; yet they are quite close and hence are comparable. But since both the values of pressure drop and rating lie close enough, they may be considered at par with cartridges produced on a commercial winder. [4]

3. THEORY

Winding is one of the most important operation, which is mainly occurred in spinning section. In fabric manufacturing, winding as well as rewinding is so important. The creation of large yarn packages that can be easily wounded and unwound, is called winding. This makes using the yarn on subsequent machines both easier and more economical. Winding is more than just transferring yarn from one package to another.

Winding is used for wrapping string, twin, thread, yarn, wires etc. In textiles winders are used heavily especially in preparation for weaving where the yarn is wound on to a bobbin. The most of the winding operations deals with the conversion of ring frame raw material into the cone or cheeses. It also involves the preparation of the yarn package before winding.

Automatic cone winding machine is the used for winding the yarn from the hank to the cone creating large yarn packages that can be easily unwound with ease and more convenience. This makes using the yarn on subsequent machines both easier and more economical. Winding machines currently have independent heads with individually adjustable motors.

Three zones of winding

1. Unwinding zone-In this zone silk gets unwounded from hank.
2. Tension zone-In this zone proper thread tension is maintained for respective type of silk thread.
3. Winding zone-in this zone silk gets wounded on bobbin.

3.1 Methods of Driving a Winding Machines

1. Drum-driven or random winder
    1. Surface contact driving
2. Spindle-driven or precision winders
    1. Direct package driving at constant speed
    2. Direct package driving at variable speed

1. Drum-driven or random winder

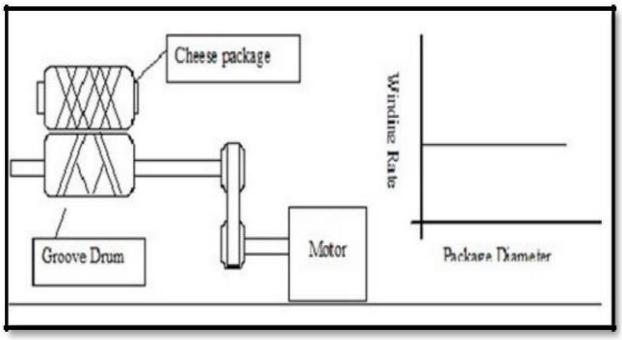

Fig.2 Surface contact driving

In this process the groove drum is rotated by the motor. The drum is in contact with the package so as the drum rotates the package also rotates. The grooves in the drum provide the traversing motion for the yarn. Here the winding rate stays constant as package diameter increases.

2. Spindle-driven or precision winders

2.1 Direct package driving at constant speed

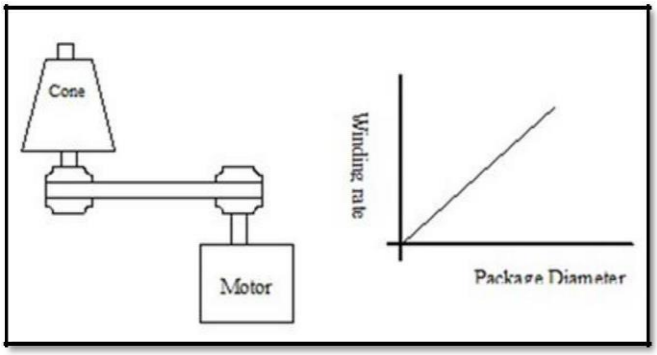

Fig.3 Direct package driving at constant speed

In this system the yarn package is placed in a spindle and the spindle is rotated with the motor. Therefore the package gets motion directly from motor. The package gets angular motion and the yarn take up rate is directly proportional to package diameter as shown in graph.

2.2 Direct package driving at variable speed

In this system the yarn package is placed in a spindle and the spindle is rotated with the motor. Therefore the package gets motion directly from motor. Here the rotational speed of package is varied inversely to package diameter to keep winding speed constant as shown in graph.

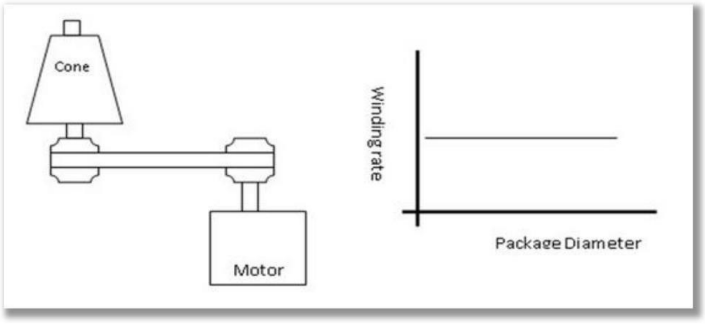

Fig.4 Direct package driving at variable speed

The motor transmits the drive to the pulley mounted on the shaft of the motor. With help of belt this pulley transmits drive to another bigger pulley mounted on the main shaft, further the drive is transmitted to the plastic die which is rigidly mounted on the shaft and the package get its drive due to surface contact with plastic die, thus the thread gets wounded to the package Here the package that is cone or bobbin is hold between the two arms of gripper called cradle. it also provides rotational movement to cone with the help of bearings so it allows the package to get wound around the cone.

4. DESIGN METHODOLOGY

Design consists of application of scientific principles, technical information and imagination for development of new or improvised machine or mechanism to perform a specific function with maximum economy & efficiency. Hence a careful design approach has to be adopted. The total design work has been split up into two parts;

1. System design.
2. Mechanical Design.

System design mainly concerns the various physical constraints and ergonomics, space requirements, arrangement of various components on main frame at system, man + machine interactions, No. of controls, position of controls, working environment of machine, chances of failure, safety measures to be provided, servicing aids, ease of maintenance, scope of improvement, weight of machine from ground level, total weight of machine and a lot more.

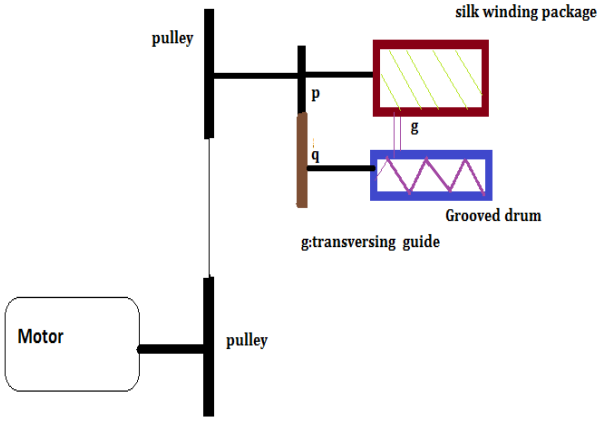

Fig.5 Precision winding principle

In mechanical design the components are listed down and stored on the basis of their procurement, design in two categories namely,

1. Designed Parts
2. Parts to be purchased

For designed parts detached design is done & distinctions thus obtained are compared to next highest dimensions, which is readily available in market. This amplifies the assembly as well as post production servicing work. The various tolerances on the works are specified. The process charts are prepared and passed on to the manufacturing stage.

The parts which are to be purchased directly are selected from various catalogues & specified so that anybody can purchase the same from the retail shop with given specifications.

5. CONCLUSION

As discussed earlier that this method will be more effective way of reducing the disadvantages of the mechanical method of changing the winding process and parameter. It reduce the inventory cost, a since large no. Of gears and scroll cams will not be necessary the process of the winding of silk is very easy and effective.

Precision winding is obtained in this machine. The cost and other parameter are required very less. So the machine will be beneficial for the small industries and the handloom worker. The most interesting modification is that the system can be operated on the precision as well as semi precision winding principle.

Manual winding is quite tedious job to do and it depends completely on the skills of worker .But the machine can be used by any other person without much knowledge of the winding techniques. Human interaction is needed only at the time of thread breakage. Thus increases human comfort.

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BIOGRAPHIES

Akash Gavhane, SND COE& RC Yeola, Pune University, Department of Mechanical Engineering.

Pramod Gavhane , SND COE& RC Yeola, Pune University, Department of Mechanical Engineering.

Sagar Pekale, SND COE & RC Yeola, Pune University, Department of Mechanical Engineering.

Manish Gulave, SND COE& RC Yeola, Pune University, Department of Mechanical Engineering.

Prof. S S Chuadhari Assistant Professor, SND COE& RC YEOLA, Pune University,Depatment Of Mechnical Enginerring,