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Water jet looms slider and connector -A review

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Abstract: water jet looms weaving machine inserts the weft yarn by highly pressurized water. The relative velocity between yarn and water jet provides the traction force. Slider and slider connector which are relative motion to each other and wear out the soften material. Depends on effect of loads, sliding speed and times on the wear rate for different material. Slider connector we change the material and working on different speed to get which material best for water jet looms slider and slider connector.

Keywords: slider, slider connector, water jet looms, cause of wear..

I. INTRODUCTION

The process of waving is known since a long time, it stands of two distinct sets of yarns or threads to form a fabric or cloth. The threads which run lengthways are called the warp yarns and the ones running across from side to side are the weft yarns or fillings. They passing the weft yarn though the warps in a perpendicular direction, in a way that those are avoiding the warp yarn alternately on top and bottom side. The fiber after passing is pushed to the already woven textile, and the next turn is going the other way creating a kind of mesh, meanwhile the textile (see 1.1. Figure).

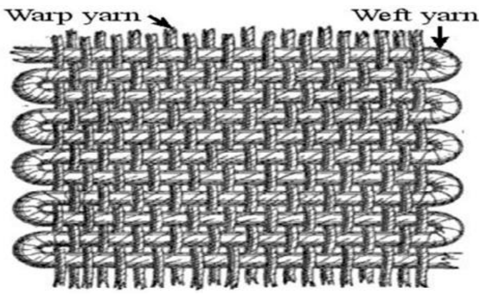
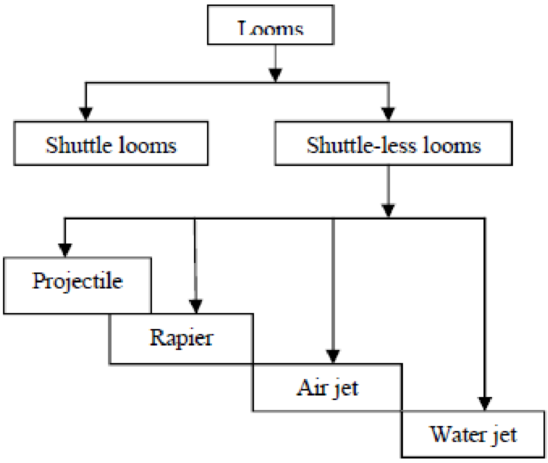


Fig. 1.1 weaving frame [1].

As the woven techniques progressed the cloth was woven on looms, a device that holds the warp threads in place while filling threads are woven through them. It fastened the process a lot, because the warp yarns did not have to be separated every time when crossing the weft, instead they were hold by the so called heddles and could be reordered by a lathe. Excellent fabric quality and maximum profitability are the two major requirements in today competitive fabric forming system.

1.2 Classification of looms

1.2.1 Based on weft insertion system



1.3 Shuttle Looms

Primitive looms make no use of a shuttle, merely passing through the shed as tick with weft wound on it. Shuttle looms fall in to two group according to whether the shuttle is replematically by hand or automatically. The second kind is often describe as an a opposition by means of an electrically transmitted impulse.[6]

1.4 Projectile looms

The projectile looms node appearance in the market at the beginning of the 50's and stills The projectile weaving machine is characterized by a good productivity level.450 rpm and 1050 m/min of insertion weft and by high operation reliability. Its established especially in the field of machine with high reed width. In this weaving machine the weft insertion is carried out by small clamp projectiles. Which number depends on the weaving width and which with their grippers take out the weft yarn from big cross-wound bobbins and insert it in to the shed always in the same direction the use of advanced electronic system as well as of microprocessors for the supervision and the control of various devices.[6]

1.5 Rapier looms

A stationary package of yarn is used to supply the weft yarn in the rapier machine. One end of a rapier, a rod or steel tap, carries the weft yarn. The other end of therapies is connected to the control system. the rapier moves across the width of the fabric, carrying the weft yarn across through threshed to the opposite side. the rapier is then retracted, leaving the new picking place**.** Rapier looms are machines in which the means of carrying the weft through the shed is fixed in the end of a rigid rod or in a flexible ribbon, this being positively driven. A rapier machine may have a single rapier to carry the weft across the full width or a single rapier operating bilaterally with a centrally located bilateral weft supply or two rapiers operating opposite's sides of the machines. Rapier looms are very efficient and their speed range from 20 to 260 ppm.these looms can manufacture a variety of fabrics ranging from muslin fabric to drapery fabrics and even upholstery
fabrics.[6]

1.6 Air jet looms

The Air Jet weaving machines are the weaving machines with the highest weft insertion performance and are considered as the most productive in the manufacturing of light to medium weight fabrics, preferably made of cotton and certain man-made fibres. These machines are the ideal solution for those who want to produce bulk quantities of customized fabric styles. The weaving widths range generally from 190 to 400 cm.In air jet looms, a jet of air is projected across the shed with the force, that takes the filling yarn to the other side. a jet of air is used to propel the weft yarn through the shed at Speed of up 600ppm. Uniform weft yarn is needed to make fabrics on this looms. Also heavier yarn is suitable for air jet looms as the lighter fabrics are very difficult to control through shed. However, too heavy yarns also can't be carried across the loom by air jet .in spite of this limitation;

air jet loom can produce a wide variety of fabrics It has however to be considered that the air jet weaving machines require a high energy consumption to prepare the compressed air and that this consumption rises definitely with increasing loom width and running speed. The reduction in the energy consumption is in fact one of the main concerns of the manufacturers, and builds for the user an important selection criterion.[6]

1.7 Water jet looms

Water Jet machines are extensively used in East Asia. They are characterized in particular by high insertion performance and low energy consumption. These machines are produced only by few companies and are used for the manufacture of light and medium weight fabrics with standard characteristics and in water repellent fiber materials, primarily multi-filament synthetic yarns. They are characterized in particular by high insertion performance and low energy consumption. In water jet looms a water jet is propelled across the shed with the force that takes the filling yarn to the other side. In it, a pre measured length of weft yarn is carried across the loom by a jet of water. These looms are very fast with speeds u to 600 ppm and very low noise. Also they don't place much tension

on the filling yarn's the pick is tension less, very high quality of warp yarns are needed for efficient operation.also,only yarns that are not readily absorbent can be used to make fabrics on water jet looms such as filament yarn of acetate, nylon, polyester and glass. However, it can produce very high quality fabrics having great appearance and feel. These machines are produced only by few companies and are used for the manufacture of light and medium weight fabrics with standard characteristics and in water repellent fiber materials, primarily multi-filament synthetic yarns. Water jet machines are extensively used in East Asia, but have limited importance in other countries.

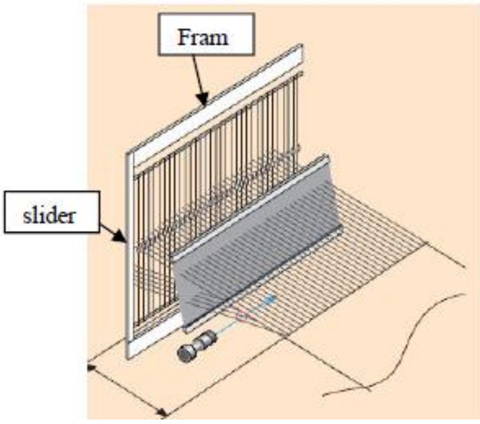


Figure: 1.2 Adhesion of weft with the water stream.

They are performance and low energy consumption.[6] Water-jet weaving Suitable for filament weaving Non-aqueous based size materials to be used High productivity, Very good quality, Stable filling insertion, Energy conservation, less vibration.

1.8 Multiphase looms

The multiphase looms can from many different sheds at place, thereby enabling insertion of number of filling yarns, one behind the other.[6] Briefly, all major development in weaving machinery has been geared primarily towards the four objectives:

- Increasing productivity,
- Improving fabric quality,
- Reducing the number of operation and hence operation through automation,
- Use of electronic and microprocessor

For better monitoring of various mechanisms to achieve the above objective and reduce the cost of
Production.

1.9 Environmental problem

Looms speed and weft insertion rates are not the only criteria to assess looms performance. Here are other factors like environment which are equally important and should be considered while designing loom. In weaving environmental problems include noise emission by weaving machines, the vibration they generate and its impact on surrounding, deposal problems, protection of personal and energy consumption. The simplest method of reducing noise is to reduce the operating speed which is certainly not the solution all though remarks success has been achieved in improving the performance of looms in terms of productivity has been archived by use of electronics. Therefore, this particular field needs further attention by researcher.[6]

II. WATER JET LOOMS SLIDER AND CONNECTOR.

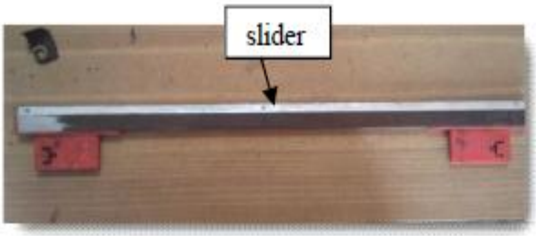


Figure: 1.3 Slider of water jet looms.

Figure: 1.4 Slider connector in water jet looms.

In fig 1.3 and fig 1.4 shows that slider and slider connector. Slider is made by aluminum and connector made by cast iron we change the slider connector material to nylon and analysis to wear out to different speed and different load.

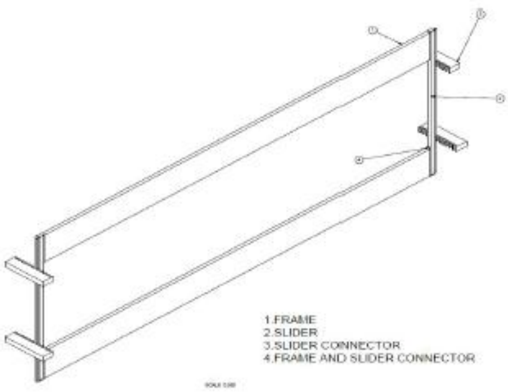


Fig 1.5 Water jet looms frame ,slider and slider Connector

The weft insertion on a water jet weaving machine is divided into three phases

(1) Acceleration of the water n the pump b prior to its injection in to nozzle
(2) Jet out let from the nozzle
(3) Flow in the free environment in different forms

- Compact
- Split
- Atomized slider

2.1 Principle Operation

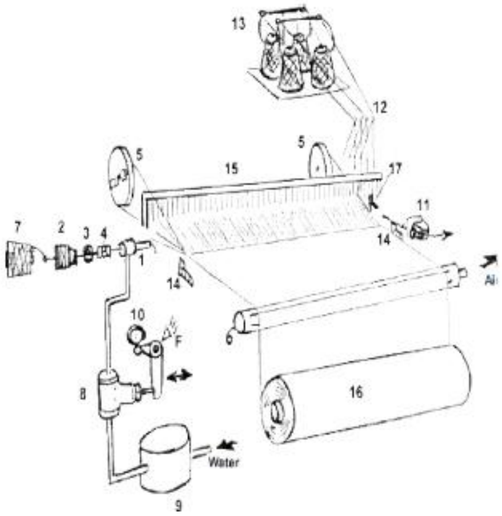


Figure: 2.1 water jet machine operation

Figure shows 3.2 how the machine operates. The weft yarn, which is fed from cone 7, is drawn-off by a feeding and measuring device 2 and then passes through a tension regulator 3 and a weft clamp 4. When the insertion has to take place, the weft clamp loosens its hold and the thread inserted inside a nozzle 1 is struck by a jet of pressurized water and launched through the shed at high speed. After the insertion has taken place, while the weft is hold flat by the threads which are moved by the leno mechanisms 5, the thermal knives 14 enter into action on the launch side to cut the weft, and on the opposite side to trim the fabric. A yarn clamping device 13 holds the weft waste which is cut off by the right-handed thermal knife, while rotating gears arrange for its removal (centre selvedge).

The water is conveyed by a pump 8, provided with a filter, the piston of which is controlled by a cam 10 producing the phases of water suction from the container 9 and of water supply to nozzle 1.

The sequence of the launch phases is the following: the pump 8 enters into action and the initial water jet serves only to straighten the residual small piece of weft, from nozzle 1 to thermal knife 14. This action, which has a duration time varying from 5 to 30 rotation degrees of the main shaft, depends on the yarn count and is named guide angle. The yarn flight forms a so-called flight angle, leaving clamp 4 open to permit to the pressurized water jet to insert the weft thread into the shed. The clamp opening time varies according to reed width and to loom running speed. On yarn exit from the shed, there is an electrical feeler or an infrared sensor which checks the presence of the weft end and makes the machine to stop in case of absence of
the weft.
A drying device removes the humidity absorbed by the fabric, sucking it through grooves produced in the front beam 6 of the machine. A maximum of two weft colures can be inserted (weft mixer).[4]

2.2 The working condition

2.2.1 The water quality

- Mechanical impurities must be filtered
- Must not contain sediment additives (Fe, Mg, Ca, Si)
- Hardness 5-10 in German scale
- Must be armless biologically and hygienically.

2.2.2 The working condition

- Operating temperature of water 16-24 ^{o}C
- Operating pressure of water .5-1.5 Kg/cm^2

2.2.3 Design modification of weaving machine

The machine should be provided with an anti corrosive protective finish or the machine parts (i.e, reed, temles, healds) should be made of corrosion resisting steels.

2.2.4 Water extraction and final drying

- The cloth may contain a great of water
- It is achieved through a cloth squeezing or a suction and the drying
- Such a system consumes 2 to 3 kw energy and unwelcome source of additional heating in the weaving rooms.
- The waste water is usually removed in to drainage system

2.2.5 Working speed

- The width and speed of water jet looms have been gradually increased

- The modern water jet weaving can have a speed of around 1500rpm while the maximum reed width 3m and the weft insertion rate 1800 m/min.[3]

III. VARIOUS MODES OF WEAR

3.1 Wear: It is a surface occurrence in which upper layers of metal are eliminated mostly from the contacting surfaces of the mating gear teeth.

a) Polishing: It is a very slow wearing-in process in which the asperities of the contacting surfaces are
gradually worn off until a very fine, smooth surface develops.

b) Moderate Wear: The type of wear classified as moderate takes place over a relatively long period of time.

c) Excessive Wear: This is simply normal wear which has progressed to the point where a considerable amount of material has been removed from the surfaces.

d) Abrasive Wear: When abrasive wear has taken place, contacting surfaces show signs of a lapped finish some other unmistakable indication that contact has taken place.

e) Corrosive Wear: This is a deterioration of the surface due to chemical action. It is often caused by active ingredients in the lubricating oil, such as acid, moisture and extreme-pressure additives.

IV. LITERATURE REVIEWED

P.K Hari & B.K Behara,[1] investigated the major developments in weaving machinery. The maximum insertion rate achieved by various shuttle less system along with their application potential are described microprocessors have been recognized as an inseparable part of all modern weaving machines. The increased importance of versatility over productivity is highlighted keeping in view the present of fast changing fashion and style in textile trade.

Saad Mukras, Nathan A. Mauntles.Nam h. Kim, tony l. Schmitz and Gregory Sawyer,[2] investigated on the prediction of wear for systems in which progressive wear affects the operating condition responsible for the wear. A simple slider crank mechanism with wear occurring at one of the joint is used to facility the study. for the mentioned mechanism, the joint reaction force responsible for the wear is itself, affected by the progressive of wear.it is postulated that the system dynamics and the wear are coupled and evolved simultaneously.

Maniya K D,[3] investigated to perform multi-attribute evaluation of water jet looms machine alternatives using analysis hierarchy process(AHP).During the selection process of alternatives, determination of the importance weight of customer requirement is essential and decisive step. the Analytical hierarchy process (AHP) has been used in weighting the importance between attributes. Hierarchical structures constructed for the water jet weaving machine alternatives and attributes. One example is illustrated to demonstrate the multi-attribute evolution of water jet weaving machine alternatives using analytical hierarchy process.

. M.A.Chowdhury, M.K.khalil, D.M.Nuruzzaman, M.L. Rahaman,[4] investigated experimentally the effect of sliding speed and normal load on friction and wear property of an aluminum disc sliding against stainless steel pinto do so, a pin on disc apparatus was designed and fabricated. Experimental were carried out under normal load 10-20 N Speed 500-2500 rpm and relative humidity 70%,result show that the friction coefficient decreases with the increase of sliding speed and normal load for aluminum. It is also found that the wear rates increase with the increase of loading speed and normal load.

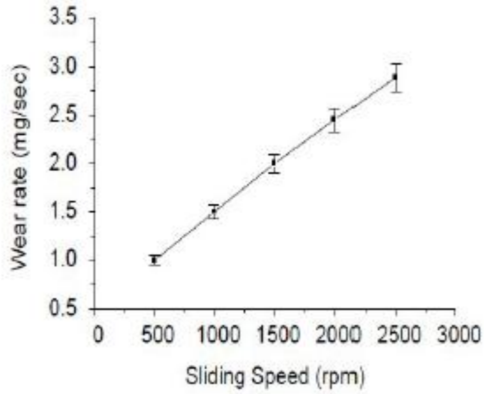


Figure: 4.1 variation of wear rate with the variation of sliding speed (relativehumidity=70%, normal load=10N).[4]

Koji Kato,[5] investigated soft or hard coating, multi-phase alloying and composite structuring have been developed to control wear and friction by improving material and surface with some aspect for better properties of friction and wear. Typical wear behaviors of representative materials of coating,composite,metallic alloys and ceramic also are reviewed in relation to their friction behavior and fundamental mechanisms of wear are conformed for the technical development of wear
control.

N Gokarneshan, N Jegadeesan & P Dhanapal investigated,[6] the critical analysis of the research development in the shedding mechanism has been reported. The use of angle shedding disks without dynamic loading in multi-phase weaving machines enables to weave higher pick densities and difficult varieties of fabrics. Other researchers have been directed towards more effective healed movements and better design of shedding cams. The paper also highlights the various development related to these areas and provides scope for further in the shedding mechanism.

Jih-Lian Ha, Rong-Fong Fung,_, Kun-Yung Chen, Shao-Chien Hsien,[7] investigated The formulation is expressed by only one independent

variable and considers the effects of mass, external force and motor electric inputs. Comparing the dynamic responses between the experimental results and numerical simulations, the dynamic modeling gives a wonderful interpretation of a slider-crank mechanism. The parameters of many industrial machines are difficult to obtain if these machines cannot be taken apart The method promotes the calculation efficiency very much, and is calculated by the real-code without the operations of encoding and decoding. The results of numerical simulations and the experiments prove that the identification method is feasible

V. CONCLUSION

The work presented here speed and normal load indeed affect the friction force and wear rate considerably. The values of friction decreases with the increasing of sliding speed and normal load. The wear rates, on the other hand increase with the increase of sliding speed and normal load. As the (1) the friction coefficient decreases (2) wear rate increases with the increases of normal load and sliding speed, therefore maintaining appropriate level of sliding speed and normal load friction and wear may be kept to some lower value to improve mechanical processes. New technology for better control of wear becomes possible by combining this effect better

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