## 1. BASIC TEXTILES TERMS:

- **Yarn:** A continuous strand of fibers/filament, twisted /non twisted, it is basic raw material for weaving.
- **Type of Yarns:** single yarn, double or multi fold yarn, spun yarn & filament yarn etc.
- **Yarn count:**
- Yarn count is the numerical expression of yarn, which defines its fineness or coarseness. (Linear density).
- Yarn count system:
- Indirect system: English count (Ne), Worsted Count etc.
- i.e. Higher the yarn number, finer the yarn.
- Direct System: Tex, Denier
- i.e. Higher the yarn number , Coarser the yarn.
- Similarly numerical expression of fineness or coarseness of sliver & roving are called Hank.
- Note: English (Ne) count system is commonly followed India.
- English Count: No. of Hanks of length 840 yds weighing in 1 pound
- 1yds: 0.9144mtrs
- 1lbs: 0.453 Kgs.
- e.g. $40^S$ Ne = 40 hanks of 840 yds weighs 1 lbs.
- $20^S$ Ne = 20 hanks of 840 yds weighs 1 lbs.

## 2. WEAVING:

- **Weaving** is a process of fabric production in which two distinct sets of yarns are interlaced at right angles to each other to form a fabric or cloth.
- **Warp** The lengthwise yarns are called the warp yarn and the widthwise yarns are called the weft yarn.

- **Grain:** The grain indicates the direction of the warp or weft yarns. Lengthwise grain is a position along the warp yarns. Crosswise grain is along the filling yarn.

- **Fabric Count/ Thread Counts:** Fabric count or count, is the number of warp and filling yarns per square inch of gray goods. Count is written with the warp number first and followed by weft number. Fabric count is an indication of the quality of fabric - the higher the count, the better the quality for any one fabric and less potential shrinkage and less raveling of seam edges.

- **Balance:** Balance is the ratio of the warp yarns to filling yarns in a fabric. A fabric is said to be well balanced if the number of warp yarns and filling yarns are almost equal, For example, a piece of muslin with a thread count of 64 x 60 is considered well balanced.

- **Selvedge:** The lengthwise finished edges where yarns are closely packed are called *selvedges*. It is the self-edge of a fabric formed by the filling yarn when it turns to go back across the fabric. The conventional loom has the selvedge on both sides of the fabric. Usually the selvedge can be done in four different ways – *Plain Selvedge* (similar to the rest of the fabric), *Tape Selvedge*(*done* with larger or pile yarn to give strength), *Split Selvedge* (done for narrow width fabrics after cutting and finished with the machine chain or hem) *Fused Selvedge* (heat sealed edges of ribbon).

**Fabric Width:**
The loom determines the width of the fabric. It is measure from selvedge to the selvedge.
Hand woven fabrics are generally 27-36 inches wide.

***Dobby:***
The Dobby is a shedding device placed on the top of a loom in order to produce figure patterns by using a larger no of healds than the capacity of Tappet.

Dobby is the mechanism which attached with the loom to control the movement of heald shafts.

***Scope of Dobby Shedding Mechanism:***
When a pattern is beyond the range of a tappet either in the number of shafts to be manipulated or in the picks to a repeat of the pattern and is at the same item too small to be economically produced by a jacquard, a machine is employed which is known as a Dobby. The number of shafts it may be called upon to actuate varies between 6 to 40.

The no of heald shaft in a dobby is given below:
Dobby- Theoretical: 48
Practical (Wool & allied): 36
Practical (cotton & allied): Maximum 24 (At least 12 heald shafts are used)

In this case the healds are all operated by jacks and levers and occupy less space as compared to tappet shedding mechanism. The Dobby Shedding mechanism gives a good scope for weaving designs repeating a large no of picks and ends.
It is very easy to change the pattern, whenever a new design is required to be woven.

***Classification of dobby****:*

1. **According to lift:**
   (a) Single lift
   (b) Double lift
2. **According to figuring capacity (no. of heald shaft):**
   48’s, 36’s, 24’s, 20’s, 16’s, 12’s
3. **According to position of heald shaft:**
   (a) Vertical

(b) Horizontal

**4. According to driving of heald shaft:**

(a) Positive

(b) Negative

**5. According to shed:**

(a) Bottom close shed

(b) Centre close shed

(c) Semi-open shed

(d) Open shed

**6. According to no. of jack lever:**

(a) Single jack lever

(b) Double jack lever

**7. Broadly dobby shedding can be classified as below:**

(a) Ordinary dobby (i.e. single jack lever, single lift dobby)

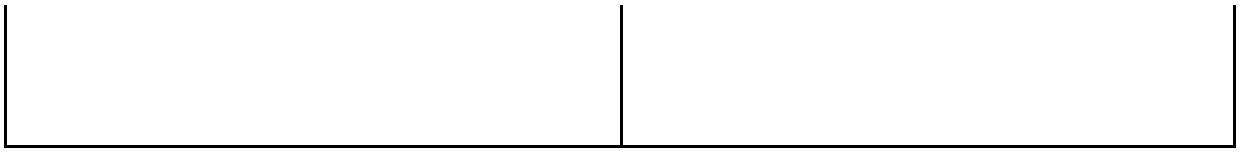
(b) Special dobby (i.e. double jack lever, 48's dobby)

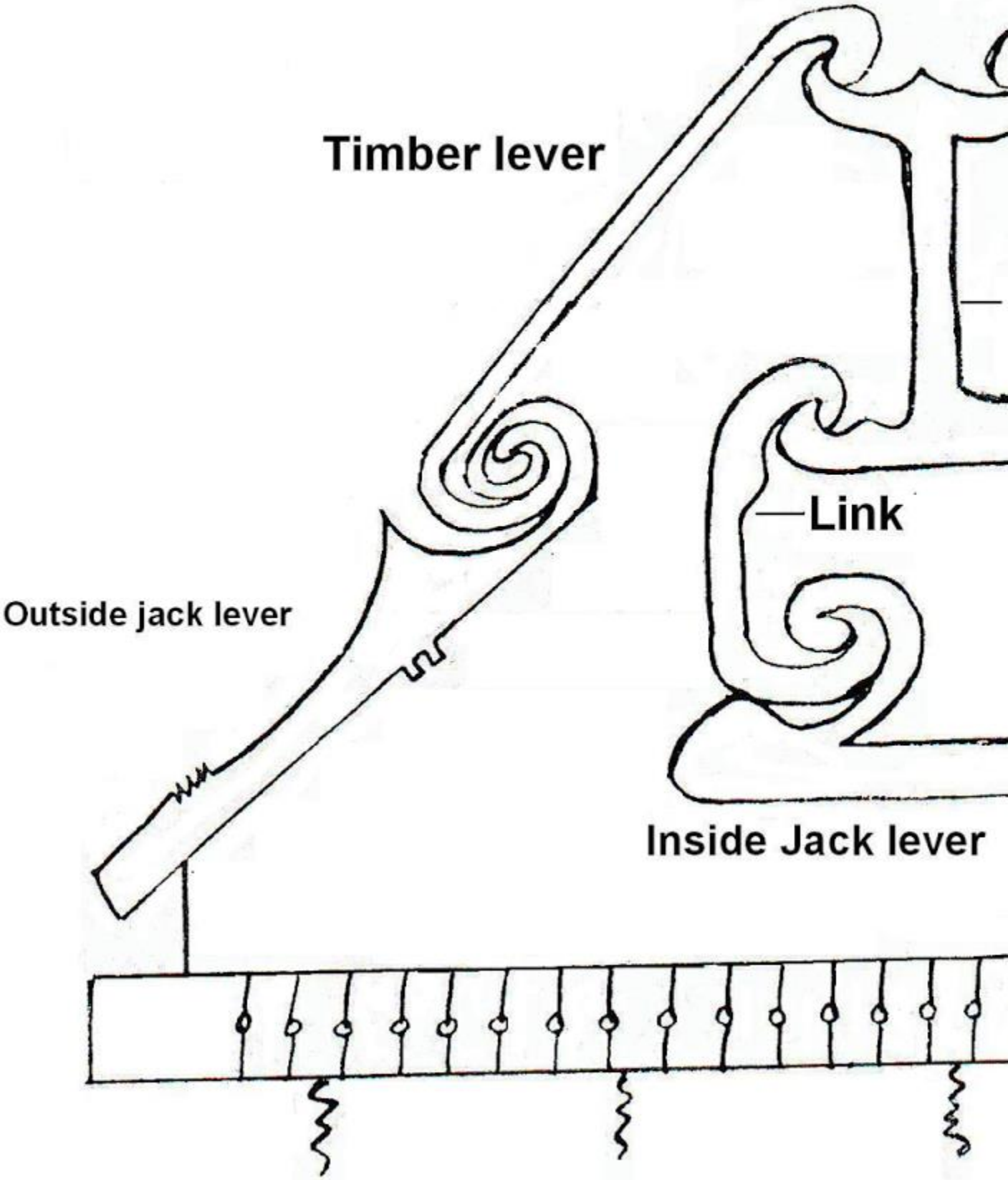
***Positive and negative dobby**:*

**Positive dobby**: The dobby which can raise and lower the heald frame without the use of an additional reversing motion is called positive dobby.For weaving heavy fabrics such as fancy woolen and worsteds, it is better to use a positive dobby.

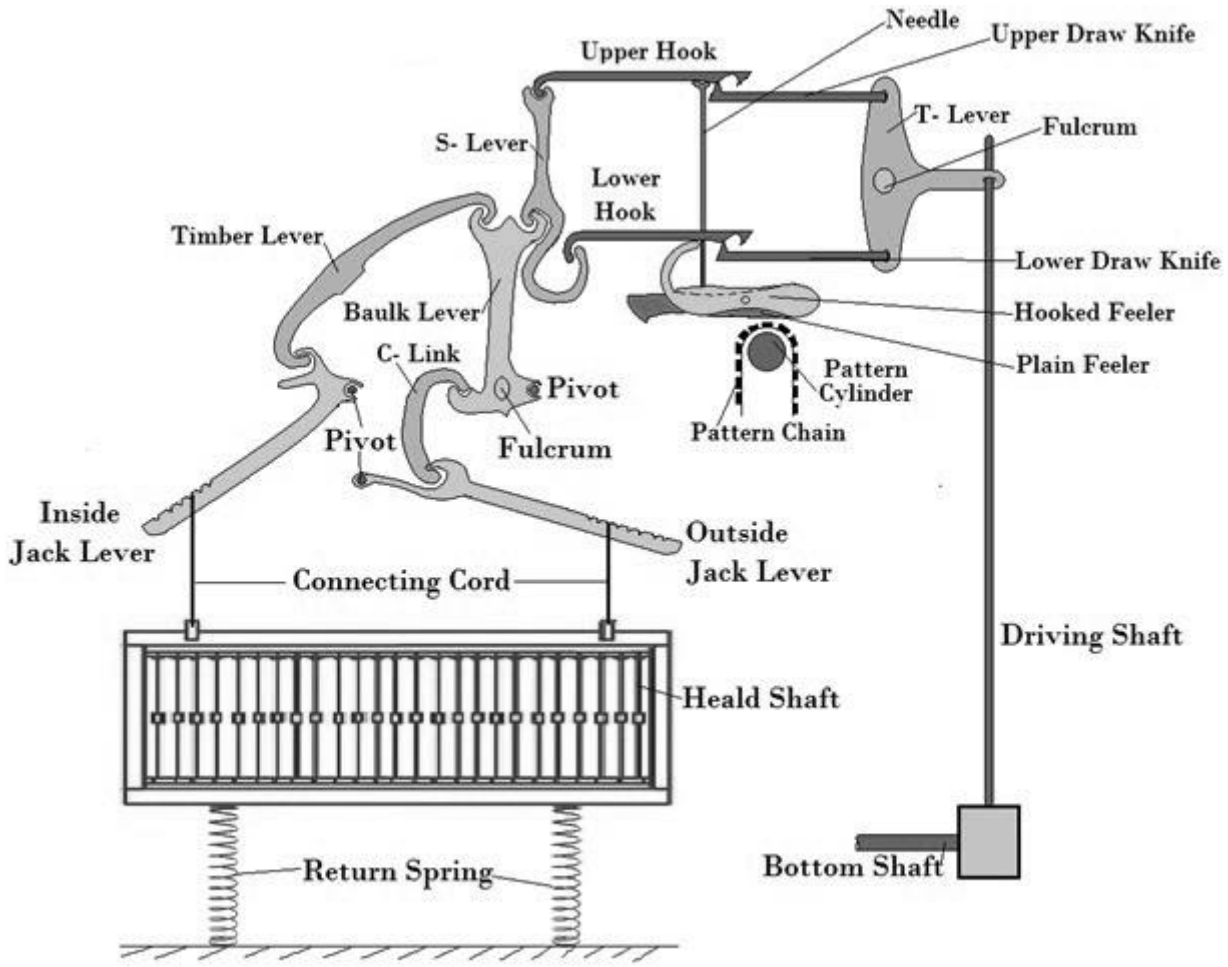
**Negative dobby**: This kind of dobby only raises the shafts. Lowering is carried out by spring under motion. Negative dobbies are used for light to low medium weight fabrics.

| **Positive dobby** | **Negative dobby** |
|---|---|
| 1. The dobby can raise and lower the heald shaft. | 1. It can raise the heald shaft and lowering is done by other mechanism. |
| 2. Additional arrangement is not required. | 2. Additional arrangement (dead wt. /spring) is required. |
| 3. Normally open shed is produced. | 3. Closed/semi-open shed produced. |
| 4. Low speed. | 4. High speed. |
| 5. Less stress & strain on warp. | 5. More stress & strain on warp. |
| 6. Heavy fabric like worsted is produced. | 6. Light fabric like cotton is produced. |




Timber lever
Link
Outside jack lever
Inside Jack lever

## Climax Dobby Mechanism




Here a climax dobby's described to explain the dobby shedding mechanism. Climax dobby's is a double lift double jack-lever negative dobby. Here two jack levers are operated by a single bulk lever. They are joined with the bulk lever by a timber lever and link. The double lever is fulcrum med at a point and is connected with S-lever. Here a climax dobby is described to explain the dobby shedding mechanism. Climax dobby is a double lift double jack-lever negative dobby. Here two jack levers are operated by a single bulk lever. They are joined with the bulk lever by a timber lever and a link. The double lever is fulcrum med at a point and is connected with S-lever. The T-lever is fulcrum med and is controlled by an upright shaft and an L-lever. They get motion from motor and machine pulley. When the feeler comes in contact with a peg and when it is not in the contact it goes down.

**System of Pegging & working:**

**Dobby for heddle shaft control:**

- Draw the design in the point paper
- Prepare the drafting plan
- Prepare the peg plan from drafting plan.
- Connect the heddles with the dobby lever as per the draft order prepared.

**Dobby for Extra warp/ Extra weft/ Buta designs:**

- In this case the ground weave/design is controlled by regular shedding mechanism.
- The extra warp or designing threads are controlled by dobby.
- Draw the design in the point paper
- Prepare the drafting plan
- Prepare the peg plan from drafting plan.
- Tie the harness with the dobby lever so as to control the figuring threads.
- Do the drawing in process for figuring threads as per the draft prepared.

**Lattice preparation :**

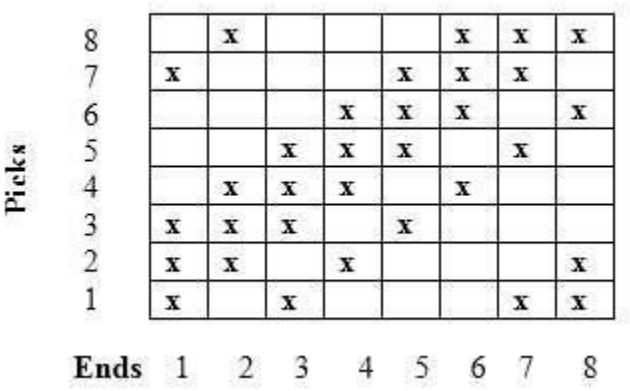
- Take the required number of lattices as planned in peg plan.
- Read the first pick and fit the log in the respective hole of lattice for end up/heddle up.
- Repeat the process for each pick till the completion of all the picks.
- Now join the pegged lattices so as to form a circular chain.
- Mount this lattice chain on the dobby.
- The Drafting plan is given in the following figure

**Example:**

**System of Pegging & working:**

Twill weave (3/3/1/1) which repeats on eight ends and eight picks has been considered here for demonstrating the pegging plan. The system of pegging is depicted in the following **Figure**. This design can be produced by using eight healds and straight draft. The selection for heald movement is controlled by wooden pegs which can be inserted within the circular holes made on the wooden lags. The wooden lags inked together into a lattice which is mounted on the pattern wheel (or barrel). The pattern barrel is rotated by a certain degree once in two peaks. For example, if the barrel is hexagonal then it must rotate by 60° after every two picks. The presence of a peg within the hole results raised position of the heald and vice versa. The position of two holes corresponding to the same heald is not on the same line. The lateral shifting of holes is done so that two adjacent feelers can be accommodated.

## Point paper representation of 3/3/1/1 twill weave



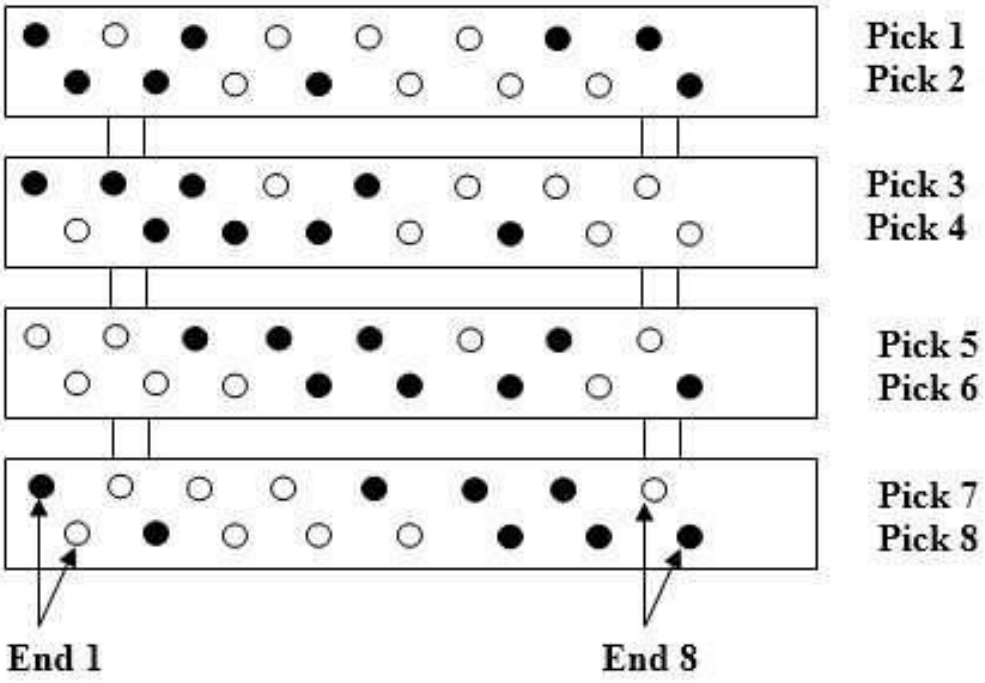

## Drafting Plan

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | **0** |
| | | | | | | 0 | |
| | | | | | 0 | | |
| | | | | 0 | | | |
| | | | 0 | | | | |
| | | 0 | | | | | |
| | 0 | | | | | | |
| **0** | | | | | | | |
| **1** | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

## Peg plan

| Picks | Ends 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 8 | | x | | | | x | x | x |
| 7 | x | | | | x | x | x | |
| 6 | | | | x | x | x | | x |
| 5 | | | x | x | x | | x | |
| 4 | | x | x | x | | x | | |
| 3 | x | x | x | | x | | | |
| 2 | x | x | | x | | | | x |
| 1 | x | | x | | | | x | x |

**Pegging on lattices**



**Paper Dobby**

In paper dobby the useful chain of wooden lags is replaced by a paper or plastic roll. Holes are punched in the paper corresponding to the pegs is the lag, that means, a hole in the paper makes the heald frame raise and a blank keeps it down through a mechanism.

**Compression between wooden lags and paper synthetic cards**

| **Comparison** | **Wooden lags** | **Paper/Synthetic Card** |
|---|---|---|
| Number of picks/m | 72 | 333 |
| Length of pattern for 100 picks | 1.39 m | 0.3 m |
| Weight of pattern for 100 picks | 2.3 kg. | 0.05 kg. |
| Time required for making up Pattern for two picks | 1.1 Hour | 0.5 Hour |

**Other advantages of the paper/synthetic cards over the wooden lags are"**

- Pattern cards of paper or synthetic material are more economical as they can be cut and copied much quicker and easier on card cutting machine. Computers can be used to punch cards.
- It is possible to have very long designs repeating on more number of picks than with wooden lag chains.
- Reduced fabric defects as chances of wooden lags being taller/shortened due to wear do not exist.
- The punched paper patterns can be stored in a small area, if required again for the future use.

**Dobby timing:**

The timing of the dobby is as follows

i. At the top center ($270^0$) the heald shafts are level; draw knives are in midway position and the T-lever of the dobby is horizontal.

ii. $60^0$ to $120^0$ is the dwell period of the dobby. The heald shafts are stationary. The shed is open and one arm of the dobby T-lever is outside, and the other inside.

iii. $90^0$ the bottom shaft crank or L-lever is at the top or bottom centre. shed remains open.

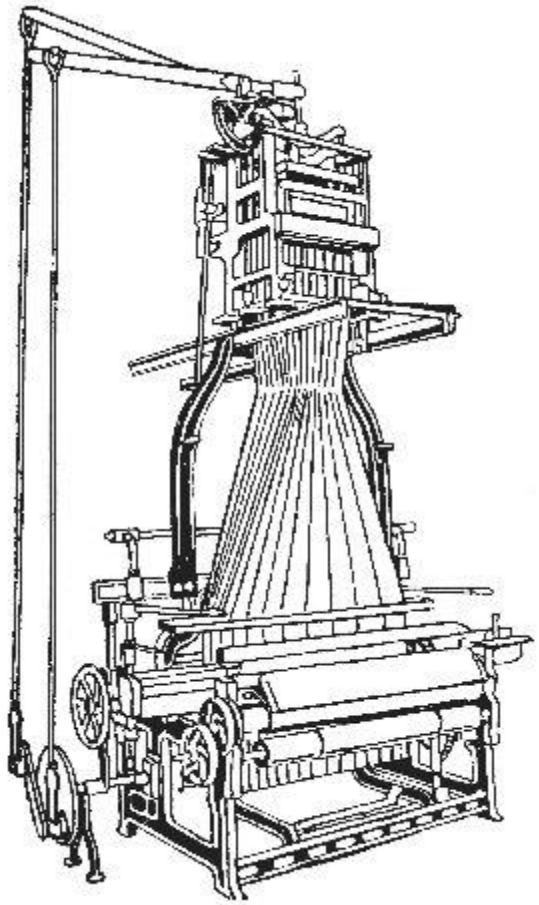
iv. $120^0$ to $60^0$ Change periods of heald shafts.

**Other Work Practices:**

- Before starting the loom the weaver should ensure optimum tension in the warp sheet so as to avoid wrong beat up and lessen the yarn breakages.
  Correct the fabric defects like wrong drawing, wrong denting, end out, double end etc., immediately and also ensure that the other fabric defects too are corrected at the earliest, before continuing further production.
- Clean the machines & work area, so as to ensure good working atmosphere, without damaging the fabrics in the looms where the cleaning work is carried out as well as in the adjacent & opposite looms
- Run the machine without " starting mark or crack"
- Ensure that the loose threads are hanged in higher length (not more than 4 mm). Accordingly, and trimmed, after attending to the warp breaks.
- Ensure that the correct weft yarn is used
- See that the weft yarn is completely used, without giving room for additional wastage of raw materials.
- Ensure correct quality of thrums are there & see that the same are properly tied
- Check the knotted loom for knotting quality etc. double ends have to be removed should report to supervisors for any deviation in the same & for any other quality issue
- Ensure that no raw material/ cloth/ spare/ tool / any other material is thrown under/ near the machines or in the other work areas.
- Check for the reasons for the frequent warp/ weft breaks. The reasons that could be corrected by himself/ herself should be corrected. Otherwise, the same has to be reported to the mechanics/ fitters/ supervisors.

**Introduction to Jacquard**

Jacquard is a shedding device use to produce complicated woven designs which cannot be made using tappet or dobby shedding systems. Jacquard was developed in the year 1801 by **Joseph Marie Jacquard (1752–1834)** who was a French weaver and merchant. In case of cam and dobby shedding systems, large number of yarns passing through a heald is controlled as a group, with jacquard shedding system, individual ends can be controlled independently and thus large woven figures can be produced in fabrics.



Jacquard on Loom

Types of Jacquard: Jacquard machines used at the present time are numerous and varied. However, they may be broadly divided in to two groups; Ordinary and special. Ordinary Jacquard may be further classified on the basis of the type of the shed formation achieved-

3. Bottom closed shed type with single lift, single cylinder.
4. Centre closed shed type.
5. Semi open shed type like double lift, single cylinder on double lift, double cylinder.
6. Open shed type

Special Jacquards are modifications of the ordinary ones. These are designed to increase the figuring capacity of the jacquard or to weave special types of fabrics. Some of the special jacquards are listed below.

& Cross border jacquard
& Leno jacquard
& Scale harness or banister jacquard
& Pressure harness jacquard
& Twilling jacquard
& Inverted hook jacquard
& Jacquard with working comber board
& Fine pitch jacquard

**Mechanical Jacquard systems can be classified under three categories:**

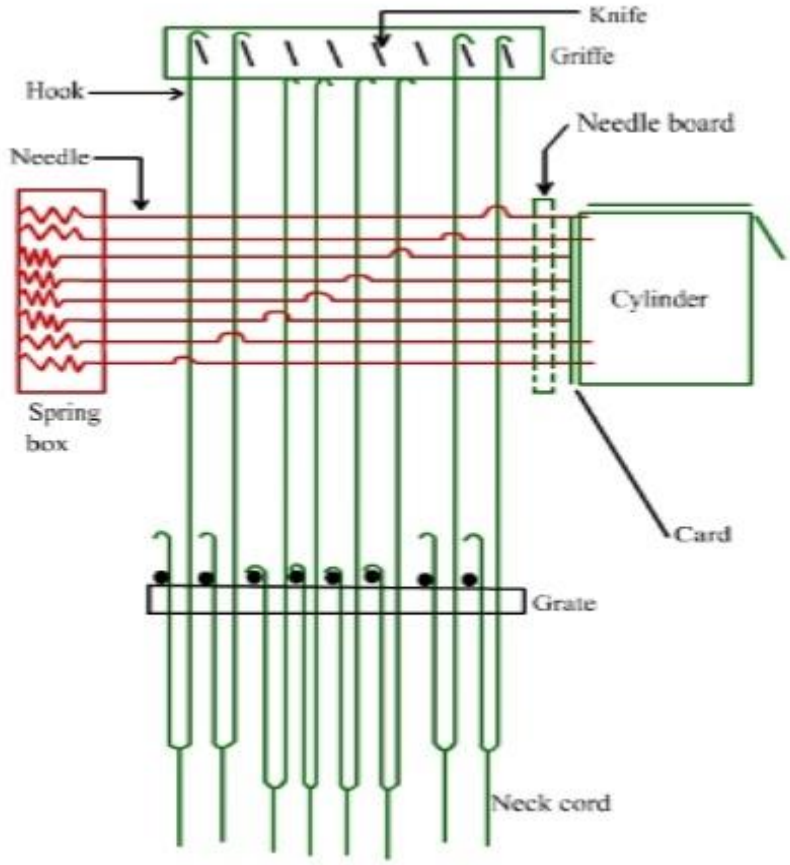
- Single lift and single cylinder (SLSC)
- Double lift and single cylinder (DLSC)
- Double lift and double cylinder (DLDC)

**SIZE AND FIGURING CAPACITY OF JACQUARD**

| Size of the machine | Hooks in a short row | Hooks in long row | Total hooks |
|---|---|---|---|
| 100 | 4 | 26 | 104 |
| 200 | 8 | 26 | 208 |
| 300 | 8 | 38 | 304 |
| 400 | 8 | 51 or 52 | 408 or 416 |
| 500 | 10 | 51 | 510 |
| 600 | 12 | 51 or 52 | 612 or 624 |
| 800 | 12 | 70 | 840 |
| 900 | 12 | 72 | 924 |
| 1000 | 10 | 100 | 1000 |
| 1200 | 12 | 104 | 1248 |

## Single-Lift Single-Cylinder (SLSC) Jacquard

Figure below shows the simplified side view of SLSC jacquard. If the machine has the capacity to handle 400 ends independently, then it requires 400 hooks (one per end) which are vertically arranged and 400 needles (one per hook) which are horizontally arranged. For example, the needles can be arranged in six rows and each row will have 50 needles. In the side view, only eight needles (one per horizontal row) are visible. Hooks, which are connected to individual ends through nylon cord (harness), are also arranged in six rows and each row is having 50 hooks. One knife is responsible for controlling the movement (lifting and lowering) of one row of hooks. However, whether a hook will be lifted or not will be ascertained by the selection mechanism which is basically a punched card system mounted on a revolving cylinder having square or hexagonal cross-section. The needles are connected with springs at the opposite size of cylinder. Therefore, the needles always exert some pressure in the right hand side direction So, if there is a hole in the punch card corresponding to the position of a needle, then the needle will be able to pass through the hole and thus the needle will remain in upright position thus making it accessible to the knife when the latter has started its upward movement after descending to the lowest height. On the other hand, if there is no hole, then the needle will be pressed towards the left side against the spring pressure. Thus the kink (which partially circumscribes the stem of a hook) present in the needle presses the hook towards the left side making the latter tilted enough from the vertical plane so that the knife misses it while moving upward. Therefore, presence of a hole implies selection




(ends up) and vice versa.

In case of SLSC jacquard, if the loom speed is 180 picks per minute, the cylinder will turn 180 times per minute (3 times per second) and the knives should also reciprocate (up and down) 180 times per minute. Thus it hinders the high loom speed. When a particular hook (and the corresponding end) has to be in up position in two consecutive picks, in between the two peaks, in descends to its lowest possible height (determined by the grate) and then moves up again. Thus it produces bottom closed shed.

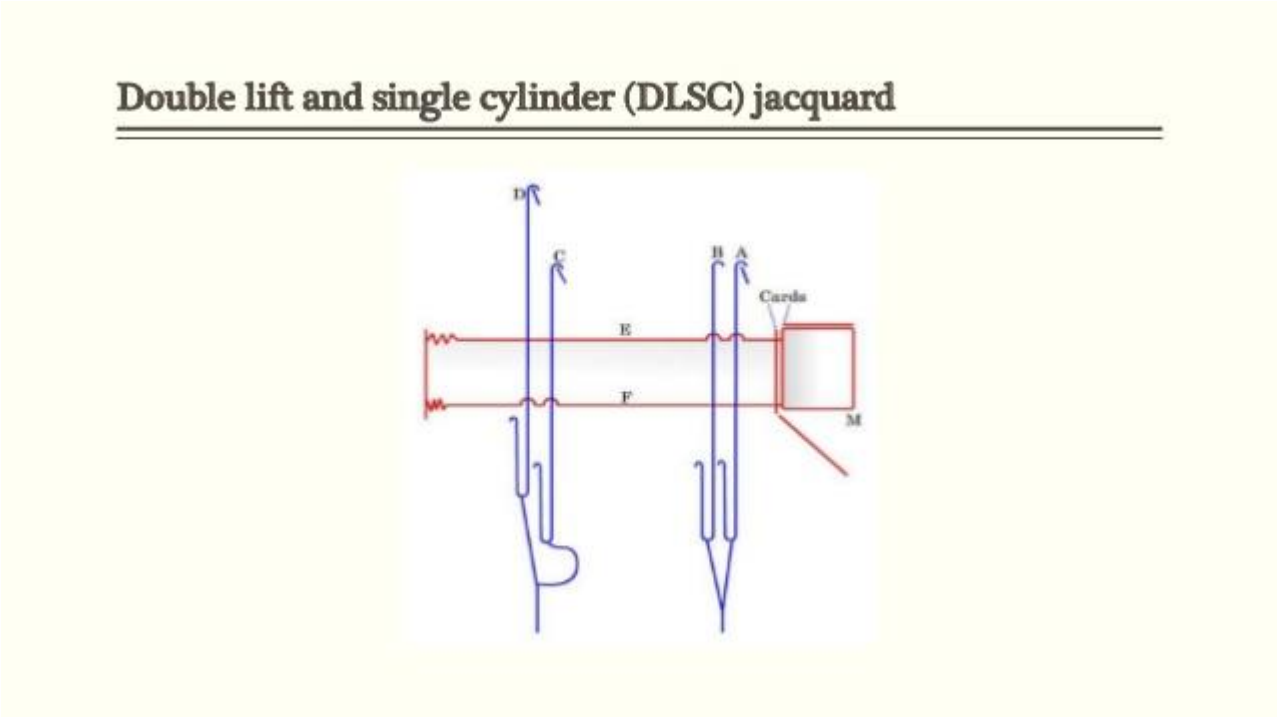
## Double lift and single cylinder (DLSC) Jacquard

In Double lift and single cylinder (DLSC) Jacquard, one end is controlled by two hooks which are again controlled by a single needle. Two sets of knives are used in DLSC jacquard and they move up and down in complete phase difference i.e. when one set of knives attain the highest position, the other set of knives attain the lowest position

In case of DLSC jacquard, if the loom speed is 200 picks per minute then the cylinder will turn 200 times per

minute but the knives will reciprocate (rise and fall) 100 times per minute. This is the advantage of DLSC jacquard over SLSC jacquard.

DLDC jacquard produces semi open shed because if a particular end has to be in raised position for two consecutive pick, it will descend up to the middle point of its vertical path and then move up. This will happen because one of the hooks will descend and the other hook will move up with their respective knives and they will cross at the middle of their vertical path. If the end has to remain in bottom position for two consecutive picks, it will remain at the bottom without any intermediate movement.



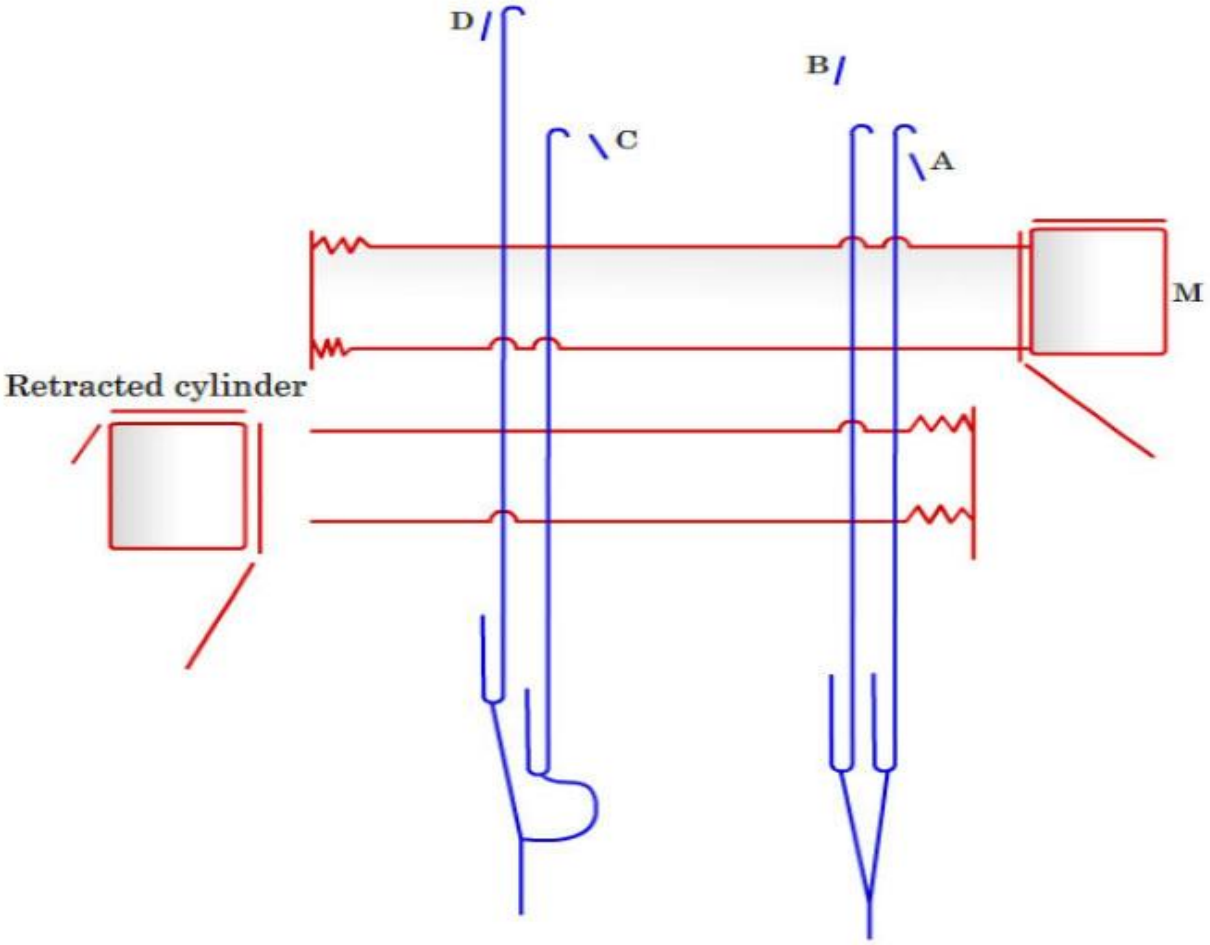

## Features of DLSC Jacquard

- 500 end machine will have 500 needle and 1000 hooks
- Two sets of knives rise and fall in opposite phase
- Cycles of movement (rise and fall) of each set of knives spans over two picks
- Cylinder should turn in every pick
- Semi open shed is produced

# Double lift and Double cylinder (DLSC) Jacquard

Figure below shows the double-lift double-cylinder (DLDC) jacquard. In case of (DLDC) jacquard, the number of cylinder rotation or turn and number of reciprocation cycle of knives is half as compared to that of SLSC. In this case, one end is controlled by two hooks as it was in case of DLSC. However, each of the hooks is controlled by separate needles.

The two cylinders work at opposite ends with individual sets of cards. The cards used for the bottom cylinder are for the odd picks, while those for the top cylinder are for the even picks. As the cylinders strike alternately to present the card with reduced speed, the selection of hooks is achieved accurately and damage to the cards is considerably reduced. The drag on the pattern card is also reduced, especially when large sets of harnesses are necessary, so the working of the machine is smooth. The loom too can be run at a relatively higher speed.



**Features of DLDC Jacquard**

- 500 end machine will have 1000 needles and 1000 hooks
- Two sets of knives rise and fall in opposite phase
- Cycles of movement (rise and fall) of each set of knives spans over two picks
- Cylinder should turn in alternate pick
- Semi open shed is produce

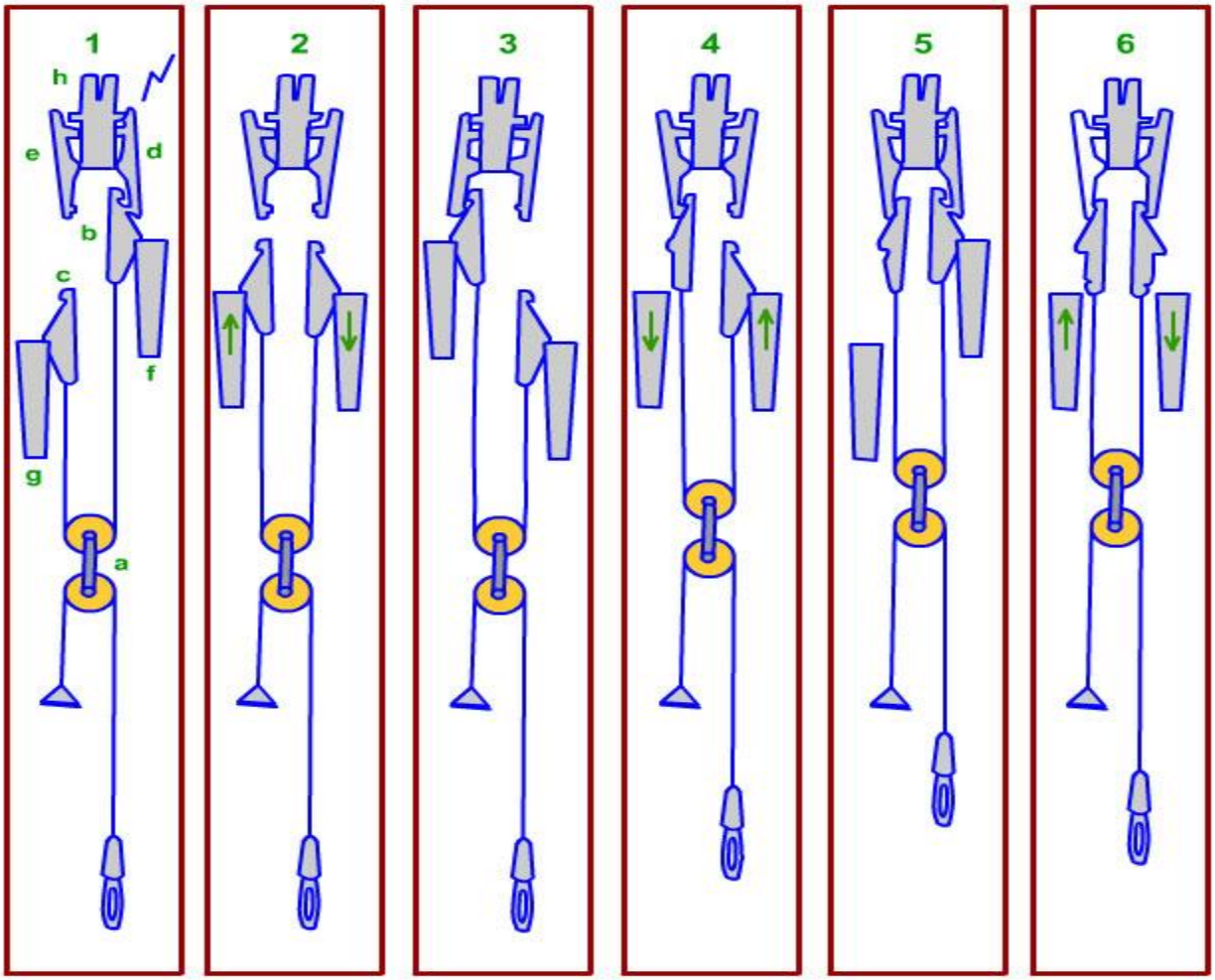
# Difference of Tappet, Dobby & Jacquard Shedding Mechanism

| Topic | Tappet shedding | Dobby shedding | Jacquard shedding |
|---|---|---|---|
| **Design capacity** | Simplest structure. | Medium i.e. complex structure. | Elaborate i.e. very complex structure. |
| **No. of heald shaft** | Maximum no. of heald shaft – 14 . Theoretically it can control 6-10 heald shaft. | Theoretically it can control maximum 48, but practically for wool no. of heald shaft -36 & for cotton no. of heald shaft -24. | Theoretically it can control any no. of warp thread individually. |
| **Speed of loom** | Very high. | High. | Slow. |
| **Driver position of heald shaft** | Below the loom. | Above the loom. | Above the loom. |
| **Design** | For different designs different tappets are fitted to bottom shaft. | For different designs, different design of pegging legs are placed on cylinder/pattern drum. | For different designs, different designed pinched cards are places on cylinder. |
| **Cost of fabric** | Low fabric cost. | Expansive. | Highly expensive. |
| **Production rate** | More than the dobby. | Less production. | Less production. |

# Electronic Jacquard

In recent times electronic jacquards have become very popular. It controls the ends by synchronized operations of following machine components.

- Electromagnet
- Retaining hook or ratchet
- Hooks
- Knives
- Double roller

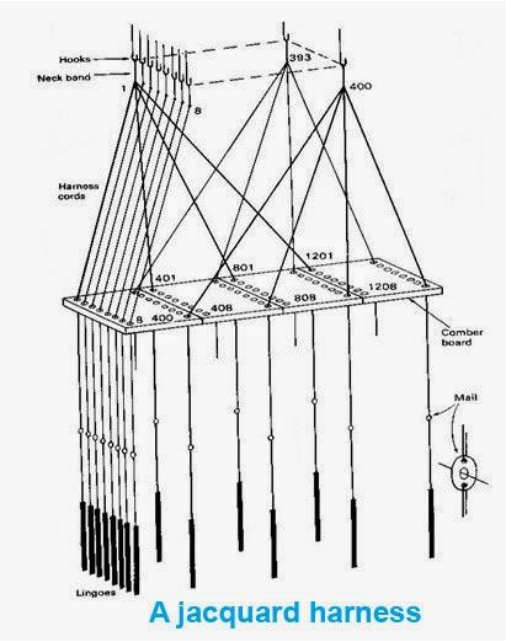



The knives are used to lift or lower the hooks. If the electromagnet is activated by the signal pattern, then it can briefly retain the upper end of the retaining hook once the latter is pressed on the electromagnet due to the upward movement of the hook. If this happens then the hook is not retained by the retaining hook when the former starts to descend with the knife. On the other hand, if the electromagnet is not activated, then the hook is retained or caught by the retaining hook.

**Harnessing:**

Harness Mounting:

The jacquard harness is the system of cords, healds and lingoes that transmit the movement of the hooks to the individual warp threads. A simple form of harness is represented in the fig. below:



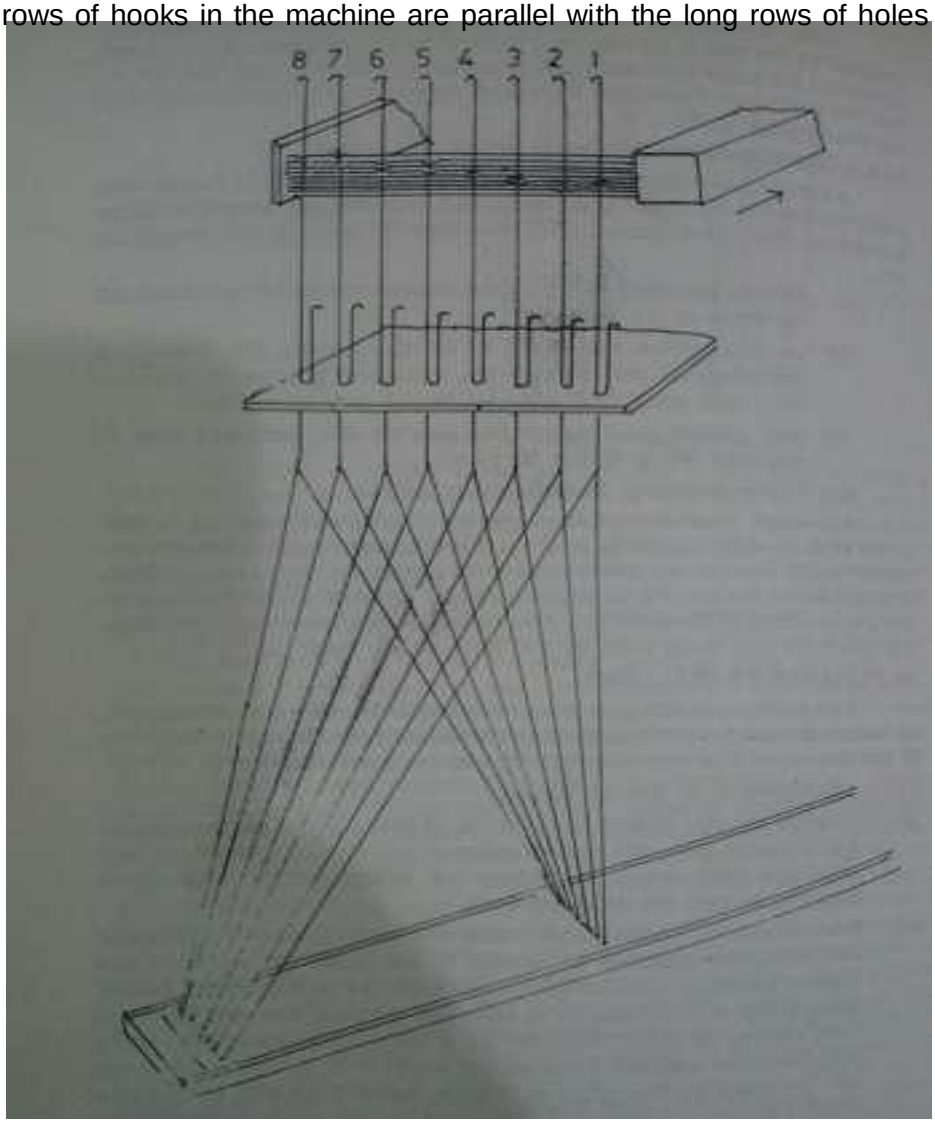
A jacquard harness

There are two main types of harness ties.

1. Straight or Norvich system.
2. Cross or London system.

**Straight or Norwich system:**

When the jacquard is placed over the loom in such a position that the cylinder is either at the back of the loom over the warp yarn or at the front, above the head of the weaver, the harness is said to have a straight or Norwich tie which is shown in the figure below. In this method, the long rows of hooks in the machine are parallel with the long rows of holes in the comber board.

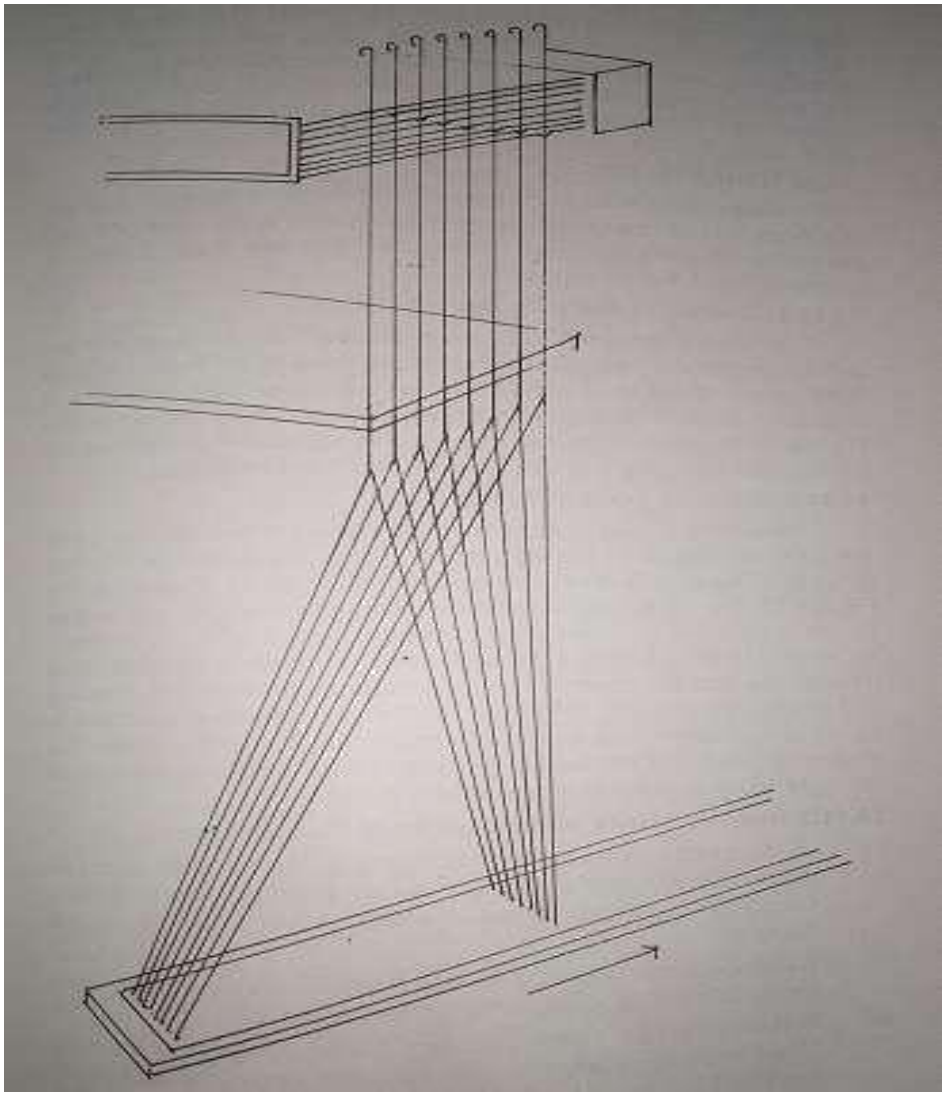



:

## Cross or London system:

When the jacquard machine is so placed above the loom that the cylinder is either to the right or left side of the loom, the harness is said to have cross or London tie as shown in figure below. The long rows of hooks in the machine are at right angles to the long rows of holes in the comber board and the harness receives a quarter turn or a partial crossing in passing from the hook through the comber board.

The only difference between this method of harness tie and the straight tie, is that the jacquard machine is turned one quarter way round with relation to the loom. When this method is used, the cards of the jacquard machine hang either over the right hand or left hand side of the loom.



The Harness tie systems are divided into the following four types.

1. Single tie-up.
2. Repeating tie-up.
3. Pointed tie-up.
4. Mixed tie-up.

**Single tie-up: (For asymmetric design)**

In this system only one harness cord is attached to one neck cord. There are must be as many hooks as there are threads in the width of the fabric. If the design is required to be woven 400 ends there are 400 hooks in the jacquard.

No. of neck cord = No. of harness cord = No. of warp in a repeat

**Scope:** This tie is used to produce a fabric containing only one repeat across the width of the fabric.

**Repeating tie-up:**

This is the most common design tie used for both Norwich and London harness ties. In this tie there must be as many harness cards tied to each neck cord as there are 4 repeats in the full width of the fabric. If there are 4 repeats of the pattern then there will be 4 harness cords tied with each neck cord.

No. of neck cord = No. of jacquard

**Scope:** This type of tie is used to produce a fabric having more than one repeat across the width of the fabric.

**Pointed tie-up: (Single repeat)**

This tie up is widely used where pointed draft is used and for symmetrical design if turned over its centre line. Suppose a design has 800 ends. Then it is divided in to two groups i.e. 400 ends in each group. So there are required 400 ends in each group. So there are required 400 Neck cords. In this system two harnesses is attached with one neck cord.

**Scope:** This tie up is used to produce symmetrical design which turned over its center line.

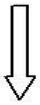
**Mixed tie-up:**

In this tie up a large number of harness cord is used. A great skill is required of designer because the design required a greater capacity of the jacquard that has been actually used.

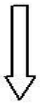
**Scope:** This tie is used if a large repeat pattern is to be produced with the existing capacity of the jacquard.

# Sequence wise preparation of Jacquard design

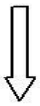
**Design repeat outline**



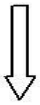
**Tracing on graph**



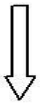
**Incorporation of weave**



**Float checking & insertion of Binding Marks**



**Card Cutting**



**Card lacing**

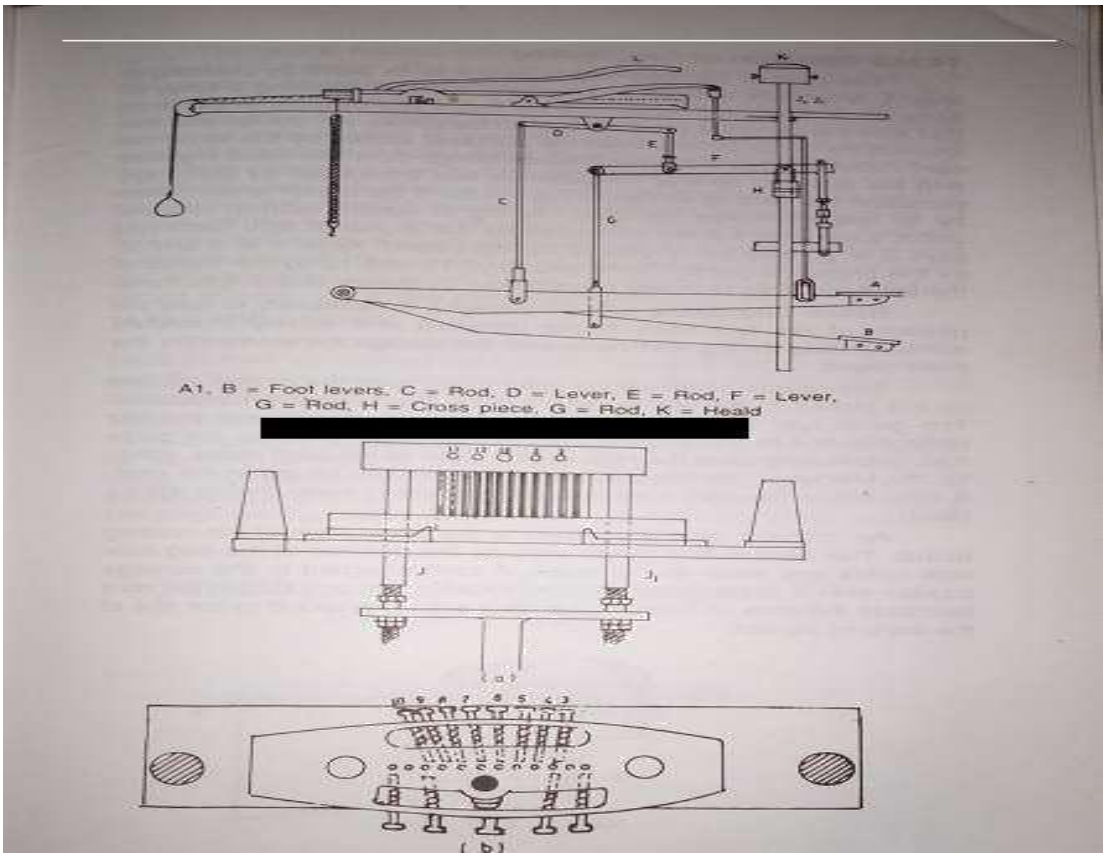
**Mounting of Card on Jacquard**

**Card Cutting:** The purpose of the jacquard weaving is to produce designs that are too expensive to be woven with tappets or dobbies. Any design that can be painted can be woven on loom with jacquard. Card cutting is an important work for a weaver working on handloom jacquard. At present card cutting can be done through some external agency to save the time and to increase the production. Even though the weaver should have some basic knowledge about card cutting and card lacing which is discussed as below.

First a design is drawn on a plain paper and then repeated a sufficient number of times vertically and horizontally to see the overall and general effect of the repeating pattern. The design is then transferred and enlarged on a suitable graph paper. The vertical lines on the graph will show the warps and the horizontal lines will show the picks. The design is enlarged on the graph paper with exact number of ends and picks as it will appear on the fabric.

Before starting the card cutting it is necessary to divide the graph paper by heavy vertical lines into a number of hooks in a short row. The design paper is guide to the card cutter. In case of a 8 hook in the short row of the jacquard, the design paper should be marked with heavy lines after every 8 small squares horizontally. This is essential because the working of all the hooks in each row is read at a time for punching a card. Thus, in a 400-machine with 8 hooks in each short row, 50 operations are required to transfer the working of 400 ends from the graph paper to the pattern card. In ordinary jacquard each card represents only one pick of the design. Thus, if a repeat is completes on 300 picks then it is essential to cut 300 cards.

**Card cutting machine:** The most common type of manually operated card cutting machine is known as **Piano card cutting machine.** A figure of card cutting machine is shown below with different views.



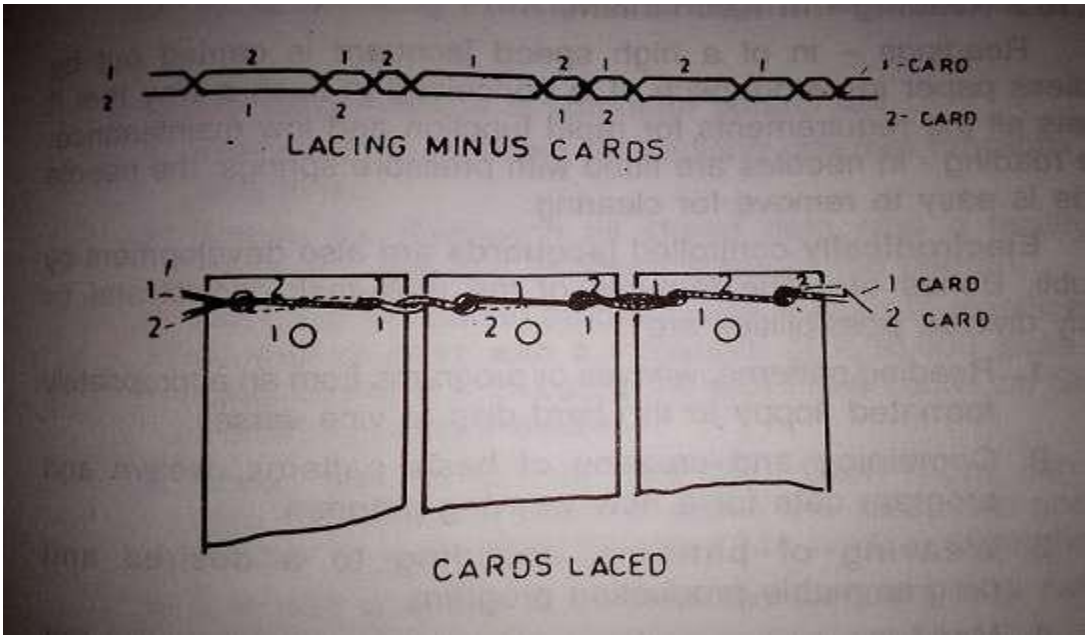
**Operation of card cutting machine:** The card is inserted and is held into its place by pressing a lever which lifts a catch to insert the card for securing it firmly into its position. The card cutter with his finger tips presses in the keys that lock the punches for the holes to be cut as per design and the card cutter presses the lever B which brings down the heads together so that the punches that are locked by their keys penetrate the card. Keys 1 and 2 are controlled by the thumb of right hand and keys 3,4,5,6 by the fingers of the right hand. Keys 7,8,9 and 10 by the fingers of the left hand and key 11 and 12 by the thumb of the left hand. Peg hole is controlled by the thumb of the right hand. In this way the cards are punched according to the required design on the graph paper mounted on the reading board. The holes on the card will represent a warp up while the blanks will represent a warp down.

**Card Lacing:**

The next operation after the cards are cut is the lacing of the cards to form an endless card chain. The card lacing is usually done by hand in case of handloom weaving.

**Hand lacing:**

A wooden lacing frame consisting of two long narrow supports for the cards is used to place about 30 to 50 cards at a time for lacing. The wooden lacing frame is studded with small metal or wooden pegs representing the pegs of the cylinder of the jacquard. The cards are placed in the serial order in the frame. A needle, threaded with a lacing twine, is used to lace the cards. The manner in which the cards are laced is shown in figure below. It is clear from the figure that the lacing cords are crossing between two consecutive holes and also between two consecutive cards.



**Summary of Calculations:**

Assuming any figure having exactly one repeat 6 x 4.8 cm is required to be woven in a cloth that counts, when finished, 50 ends and 38 picks per centimeter, and has shrunk 8% from the reed width to the finished width, while the ground weave repeats upon 20 ends and 12 picks—the particulars may be ascertained as follows.

Number of ends and picks (or cards) in one repeat of the design.

- Number of ends per inch in the reed.
- Suitable capacity of jacquard and set of harness to produce the design exactly in the size.

Counts of design paper.

- The repeat is 4.8 cm in width and 6 cm in length. The number of ends in the repeat—50x4.8= 240

  The number of picks in the repeat--- 38x6= 228
- Number of ends per cm in the reed--- 50-8%= 46
- A suitable standard capacity of jacquard in an 8-row 304-tie which will require to be cast out: 304-240= 64 hooks

The set of the harness requires to be finer than the set of the warp, because 304 harness cords have to occupy the same width in the comber board as 240 ends in the reed, and the proportion is therefore:

240 ends: 304 hooks:: 50 ends per cm: 63 harness cords per cm

# Safety in the weaving lab

In the Weaving Lab you are surrounded by opportunities to cause hurt to yourself and others. Slight carelessness can lead to big injuries. So it is necessary to remain careful and avoid accident.

- Wear protective equipment as directed. For example ear plugs, masks, hand gloves etc.nts and injuries. While working.
- Do not throw objects in the passages to avoid tripping and falling.
- Never use bare wires without plugs.
- Do not wear loose clothes which may entangle in moving parts of the machines.
- Never do anything for which you are not trained
- Stay alert near moving equipment
- Never gossip with fellow Students while operating a machine.
- Keep everything in its place. A clean environment is safe environment.
- Learn the use of fire safety equipment.
- Be courteous in talking to others
- Don’t shout

- Listen to understand not to reply
- Never use abusive language
- Take care about the words you use.
- Always keep your surroundings clean
- Keep everything at its place
- Cleanliness is the responsibility of everyone.
- Do not spill slippery material like oil on the floor.
- Make use of trolleys, racks and other storage places provided to you.
- Do not eat at work place. Use designated place for that.
- Do not spit anywhere in the organisation.
- Learn the use of first aid box and use it in the event of need to yourself or others.
- Do not waste electricity and water
- Switch off fans and lights etc. before leaving the work place.
- Do not block the approach to fire extinguishers and fire exits.

## Some short questions for Weaving Tech-II

**1. What is weaving?**
**Ans.** the process of interlacing two sets of yarns namely warp and weft, at right angle to make a fabric, according to design.

**2. What is knitting?**
**Ans.** It is the process of producing fabric by transferring continuous yarns into interlocking loops, each row of loop hanging from the one immediately preceding it.

**3. How many sets of yarn are used in knitting?**
**Ans.** One set (warp or weft).

**4. How many sets of yarn are used in weaving?**
**Ans.** Two sets (warp and weft).

**5. Is sizing required in knitted fabric?**
**Ans.** No.

**6. Write down the types/ classification of knitting.**
**Ans.** Two types,
Warp knitting &
Weft knitting.

**7. Is yarn preparation is needed in knitting?**
**Ans.** No.

**8. Is knitting fabric produce by inter looping?**
**Ans.** Yes
.
**9. Is weaving fabric produce by interlacing?**
**Ans.** Yes.

**10. In which knitting, a fabric is produce by single yarn?**
**Ans.** Weft knitting.

**11. What is the other name of warp yarn?**
**Ans**. Ends

**12. Write down the loom driving system?**
**Ans**.
Hand driving (hand loom) &
Electric motor driving (power loom)

**13. Write down/ what are the different types of shed?**
**Ans.**

Bottom close shed
Center close shed
Semi-open shed
Open shed

**14. What is shedding?**

**Ans.** Shedding is the act of dividing the warp threads according to design into two parts, to allow the passage of shuttle/weft inserting element from one side of the loom to the other.

**15. Write down/what are the types of shedding mechanism?**
Ans.

Paddle/treadle shedding (used in hand loom)
Tappet shedding (used in power loom)
Dobby shedding (used in power loom, at past used in hand loom)
Jacquard shedding (both hand & power loom are used now)
Combined shedding

**16. Normally tapped shedding mechanism produces square design (e.g. 4x4, 6x6, 7x7, etc.) (Yes /no)**
**Ans.** Yes.

**17. We can produce basic weave structures (i.e plain, twills satin) in tappet shedding mechanism (yes/no)**
**Ans.** Yes

**18. Where open shed is used?**
**Ans.** Tapped loom

**19. What is fabric?**
**Ans:** Interlacement of two or more thread of yarn.

**20. What are the primary motion?**
**Ans.** The primary motion are as follows-

Shedding
Picking
Beating

**21. What are the secondary motion?**
**Ans.** The secondary motion are as follows :

Let off
Take-up

**22. What are the auxilary motions of a loom?**
**Ans.** The tertiary motion are as follows-

Warp stop motion
Weft stop motion
Warp protector

Weft protector

**23. Where bottom & center close shed are used?**
**Ans.** Hand jacquard looms to produce delicate fabrics.

**24. Where semi-open shed is used?**
**Ans.** Double lift dobby & Jacquard.

**25. One shedding + one picking + one beating =?**
**Ans.** One weaving cycle/ loom cycle/picks cycle

**26. One picking tapped insert one pick(True or False)?**
**Ans.** True

**27. What is the result of unequal shedding?**
**Ans.** Wrong design & stitching

**28. What are the maximum numbers of heald frame controlling capacity in tapped shedding mechanism?**
**Ans.** 14

**29. Dobby shedding mechanism can produce both square and rectangular size design (yes/no)**
**Ans.** Yes

**30. What types of design can be produced by Jacquard looms?**
**Ans.** Any design

**31. What are the maximum numbers of warp threads controlling capacity in Mechanical Jacquard loom?**
**Ans.** 1800

**32. What is sizing?**
**Ans.** Sizing is the process of giving a protective coating on the warp yarn to minimize yarn breakage during weaving.

**33. What materials form the base of the size?**
**Ans.** Starch or gum

**34. What are the types of loom?**
**Ans.**

Hand loom &
Power loom

**35. What are the types of power loom?**
**Ans.**

Modern/shuttle less loom &
Conventional/shuttle loom.

**36. What is picking?**
**Ans.** To propel the shuttle or any other weft inserting elements.

**37. Write down the faults of picking**
**Ans**.

Early picking
Late picking
Smash or Bang-off
Short picking
Harsh picking
Shuttle flying out

**38. Some meaning**
**Ans.**

PPM = picks per minute
PPI = picks per inch
EPI = Ends per inch
RS = Reed space

**39 Actual production of a m/c is always less than that calculated production (True/False)**
**Ans.** True

**40. What is the object of beat-up mechanism?**
**Ans.** To push the newly inserted weft yarn (last pick) to the fell of the cloth.

**41. What is the function of take-up mechanism?**
**Ans.** To wind the already woven fabric on the cloth roller with the progress of weaving.

**42. What is pick spacing?**
**Ans.** The space occupied by a pick in fabric

**43. What is let-off mechanism?**
**Ans.** To unwind the equivalent length of warp sheet from the warp beams with the progress of take-up during weaving.

**44. What are the basic weave structures?**
**Ans.** (i) Plain (ii) Twill and (iii) Satin

**45. Write down/Classify the types of sett.**
**Ans.** Warp sett (No. of warp/inch)
Weft sett (no. of weft/inch)

**46. What is weave?**
**Ans.** Interlacement of the ends and picks with each other produces a coherent structure. The repeating pattern of interlacing is called the weave.

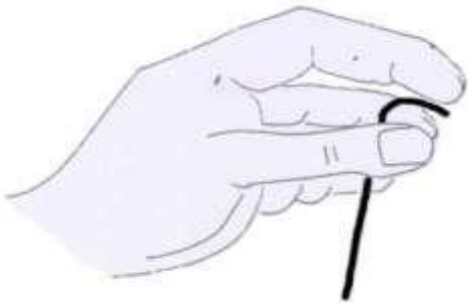
**31. What are the minimum numbers of warp threads controlling capacity in Electronic Jacquard loom?**

**Ans.** 1200

**WEAVERS KNOT**

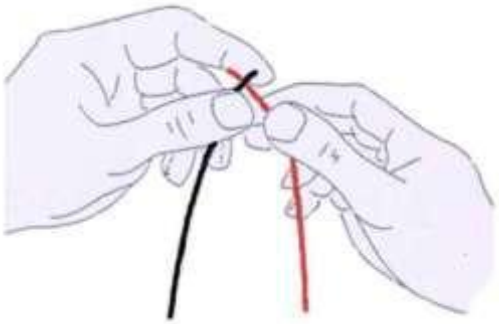
The following illustration explains the procedure for putting weavers knot.

**1.**



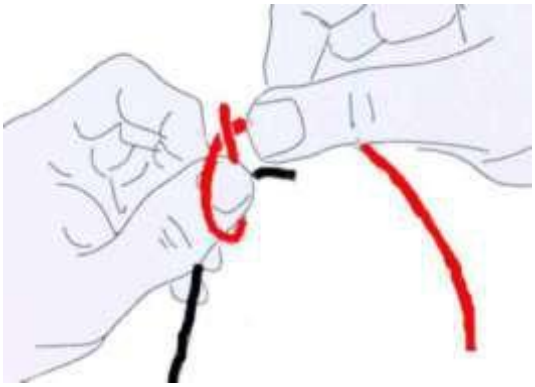
**Pick up the broken end 6 mm from its end with the left hand thumb and second (middle) finger.**

**2.**



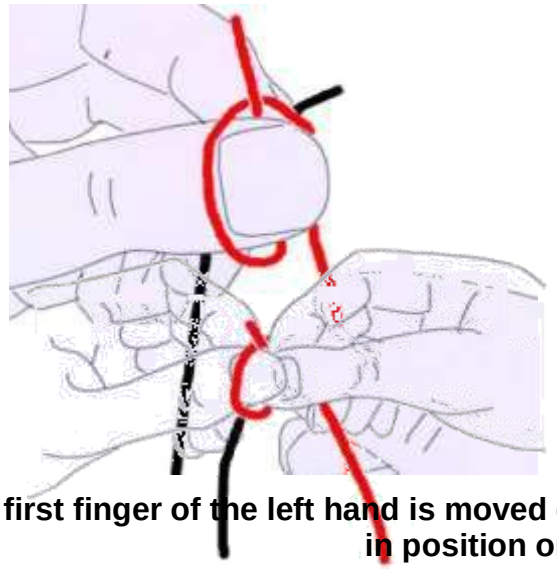
**Then tie thread is then placed under the broken end by the right hand.**

**3.**



**A loop is made with the tie thread around the left hand thumbnail, and tie thread passed behind the tie thread end.**

**4.**

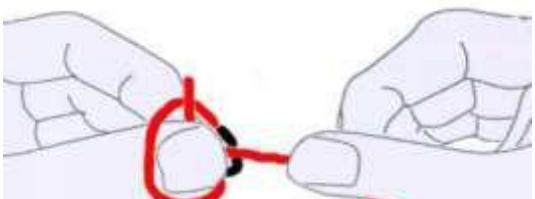


**The first finger of the left hand is moved down against the thumb to hold the loop in position on the thumb.**

**5.**

**Right hand thumb is used to push the tail formed by the broken end, under the left hand thumb.**

**6**



**To form the knot, the right hand pulls the tie thread, while the left hand holds the knot stationary. They should be no pulling by the left hand.**

**7**