

Primary Motion

Definition of weaving

Woven fabric is obtained from yarn by weaving.

Weaving is the action of producing fabric by the interlacing of warp and weft thread at right angle to each other. The warp threads are placed along the length of the fabric and the weft threads are placed along the width of the fabric.

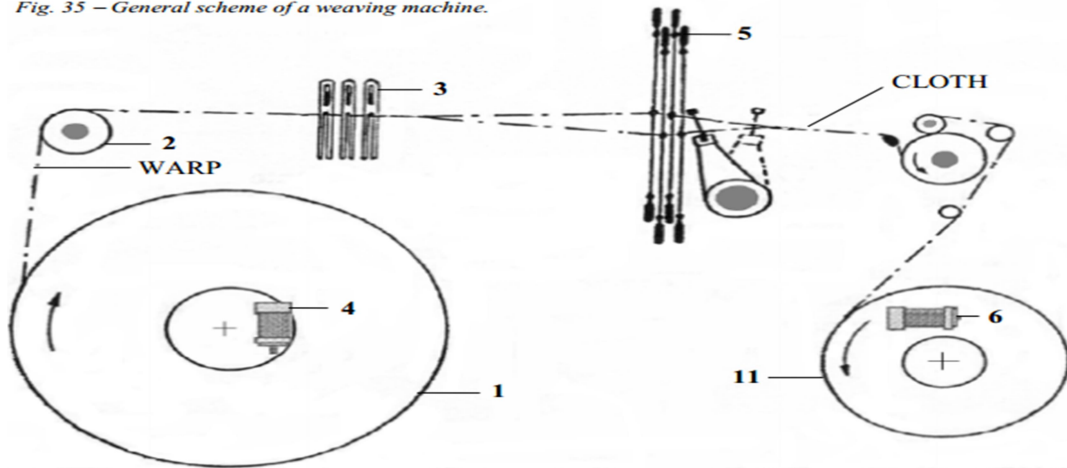
Loom: A Loom cannot be said a machine but it is a device which is used to produce woven fabric. Looms are generally driven either by line shaft or by individual motors fitted with it.

Atmospheric Condition of Weaving Room

Ambient conditions	Loom conditions	Room conditions
Relative humidity (%)	75-85%	68-72%
Temperature(C)	26-30°C	28-32°C

Kinematics Diagram of Loom

Fig. 35 – General scheme of a weaving machine.



Clutch: is a device which is used to connect shaft in such a way that the shafts can be ready engaged and disengaged. Clutches are classified as follows:

1. Frictional clutch: transmit torque by using friction force.
2. Positive contact clutch

Clutches are used to engage the stationary part with the movable (rotating) parts.

Brake: is a device which is used to bring to rest or slow down a moving body.

Electromagnetic clutch & brake system used in rapier weaving machine (available in KTSC).

Jacquard Shedding

Jacquard shedding is used for most complex and intricate designs where individual heald wires need to be controlled independently. Maximum figuring with 1600 hooks can be done.

Machine parts

Heald/Heddle: Wire or cords with eyelets that hold warp yarns in a place.

Heald shaft/Harness: A wood or metal frame that holds the heald/heddles in position in the loom during weaving. It is usually more than one.

The main function of the heald shaft is as follows:

1. It helps in shed formation
2. It is useful in identifying broken warp threads.
3. It maintains the order or sequence of the warp threads.
4. It determines the order of lifting or lowering the required number of healds for a pick. In other words it helps in forming the design or pattern in a fabric.
5. It determines the warp thread density in a fabric, i.e. the numbers of heald wires per inch determine the warp thread density per inch.

Different types of gears:- to facilitate the loom motions.

Main shaft:- to transfer motion to the required parts of the machine.

Main motor:- to run the loom.

Belts: - to transfer motion to the next part.

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Treadle: The treadle is a paddle or lever under a loom with which a thread is connected by means of cords.

Stroke: It is the max displacement of heald frame, when it is at its max position and the on min position.

Dwell period: The time for which reed is stationary at rare most position is known as dwell period of reed. The Harness frame remains stationary in shed opening position and picking media is passing through shed.

B. Picking

The action of inserting weft yarn through the warp yarns is called picking. Picking mechanism is designed to accelerate the shuttle across the shed with correct flight path & speed.

The functions of picking mechanism are:

1. To delivers the shuttle along the correct flight length.
2. To throw the shuttle at a predetermined speed.

Picking can be operated by:-

- ✓ Cam: - most widely used. (available in KTSC)
- ✓ Spring
- ✓ Pneumatic
- ✓ Crank

The cams which are capable of operating the picking mechanism are mounted on both side of the bottom shaft and are placed 180° to each other.

Rapier weaving machine produces versatile range of fabrics from outerwear fabrics to sophisticated label weaves.

The rapier machine can be classified based on:

i. Number of rapier

1. **Single sided rapier**:- rigid (circular rod)

The weft is inserted during rapier insertion, and the weft put in the shed during rapier insertion. A single rapier head moves the entire width of the machine.

2. **Double sided rapier**:- it may be rigid or flexible.

In double rapier two rapier heads covering half the width each. (available in KTSC).

(i) These looms work on bilateral principle of rapier insertion. Two rapiers are used for insertion of a full pick in each shed. Both the rapiers enter simultaneously in the same shed from opposite ends-one from the giver end with a weft thread and other from the taker end in empty condition.

(ii) The weft is transferred from the giver to the taker.

Here the two rapiers enter the shed from opposite ends, one carrying the weft, the other empty, and transfer takes place mid- way in the shed.

Double sided is advantages than single sided because it reduces the acceleration needed which in turn reduces the buckling at a given loom speed.

In double sided rapier either of the two methods of weft insertion can be used; dewas system or Gabler system.

ii. Methods of weft transfer

1. **Gabler system**: - loop transfer. (available in KTSC)

The weft is taken by the giver rapier from supply package in loop form.

The receiver side rapier reaches the center a little earlier than the feeder rapier and is opened by the opener lever.

2. **Dewas system** :- tip transfer

The end of weft is directly transferred from one side of the rapier to the other side at the time of proper shed opening.

iii. Types of rapier used

1. Flexible rapier
2. Rigid rapier (available in KTSC)
3. Telescopic rapier

Flexible rapier system:

Here the rapier heads are propelled by flexible rapier tapes of coated with steel or plastics reinforced with carbon fiber.

Using double rapier system rather than one reduces the acceleration needed which in turn reduces the buckling at a given loom speed.

Rigid rapier system

The rapiers are made of rigid tubes of steel alloys or plastics reinforced with carbon fibers and eliminate entirely the need to assist the rapier head through the warp sheet.

It requires large floor space i.e. the space required by the loom must be at least double that of the reed space to allow the rapier to be withdrawn from the shed.

Telescopic rapier system

It consists of inner and outer components telescoped together.

Machine parts

Pick sequence control unit: - to control uniform weft pattern picks.

Weft approach device: - to approach the weft yarn at the required position to rapier.

Weft finger (weft lifter):- to feed the weft yarn properly to the rapier.

Rapier head: - used to insert the weft yarn through the open shed in the warp yarn.

Rapier guide:-used to assist the rapier to be directed along the correct path and prevent buckling. To provide properly for weft transfer.

Weft cutter: - to cut the weft yarn at the required length.

Reverse motor: - to facilitate the reverse shedding to get easily the picks (picks finder motor). If no pick is present, the machine stops and then turned to pick inching position.

C. Beating-up

Pushing the newly inserted length of weft, known as the pick, into the already woven fabric at a point known as the fell.

This is accomplished with the help of a reed fixed in the sley. The sley is given a sudden and quick movement towards the fell of the cloth by the cranks in the crankshaft. The sley wood runs from one shuttle box to another, and when at its backward movement, the shuttle travels over its race.

Machine parts

Sley drive:-to move the reed forward and backward to facilitate beating.

Slay: It is the portion of loom that carries the reed and oscillates between the harness & the fell of the cloth.

It is made of wood and consists of the sley race or race board, reed cap and metal swords carried at either ends. The sley mechanism swings to and fro. It is responsible for pushing the last pick of weft to the fell of the cloth by means of the beat-up motion.

False reed: - support to form false selvedge.

Reed: A comb like wire or device used to separate yarns on a loom & to beat up the filling during weaving.

The reed performs a number of functions which are enumerated as follows:

1. It pushes the lastly laid pick of weft to the cloth fell.
2. It helps to maintain the position of the warp threads.
3. It acts as a guide to the shuttle which passes from one of the loom to the other.
4. It determines the fineness or closeness of the fabric. There are various types of reed such as ordinary reed, gauze reed, expanding reed, V reed etc.

Function of reed

- Uniform spacing (density)
- Beating mechanism
- Guide the shuttle flight
- Maintain the position of the warp threads.
- Reed gives motion to warp let-off & cloth take-up.