## Standard Properties of Wovenfabrics: Weight Range

| | |
|---|---|
| Very heavy | > 13 oz/yd2 |
| Heavy | > 6 – 13 oz/yd2 |
| Medium | > 4 – 6 oz/yd2 |
| Light | > 2 – 4 oz/yd2 |
| Very light | < 2 oz/yd2 |

### Shedding Mechanism

A process of raising and lowering of warp yarns by harnesses to make an opening for the filling (weft) yarn to pass through. The raised and lowered form of warp yarns is called shed

Three types of shedding motions (opening) are available for different type of fabrics. They are:

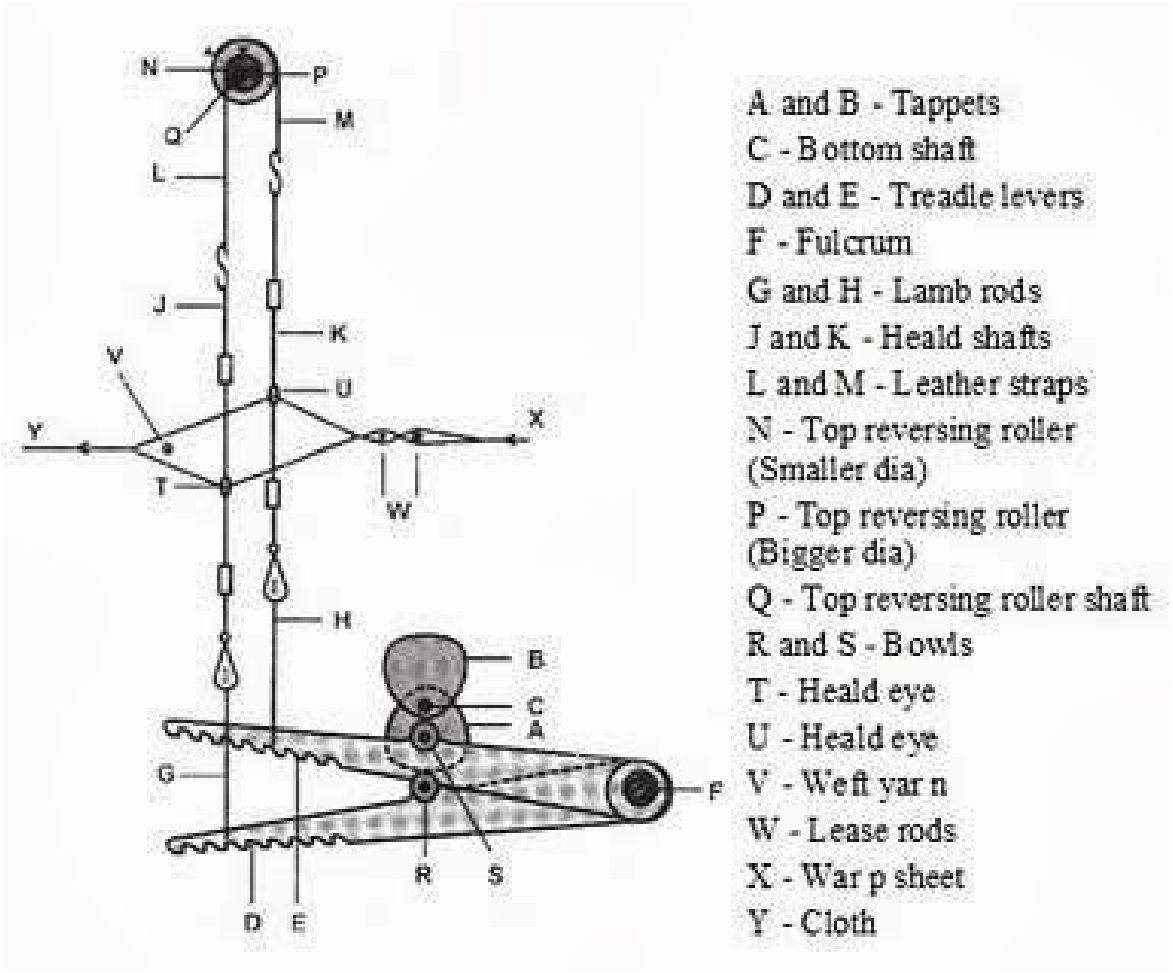
Tappet shedding Dobby shedding
Jacquard shedding

**Tappet Shedding**
A tappet is given a rotary motion so that it depresses a follower and a lever, known respectively as the anti-friction bowl and the treadle arrangement, by means of which the heald shaft is operated.

**Scope of Tappet Shedding**

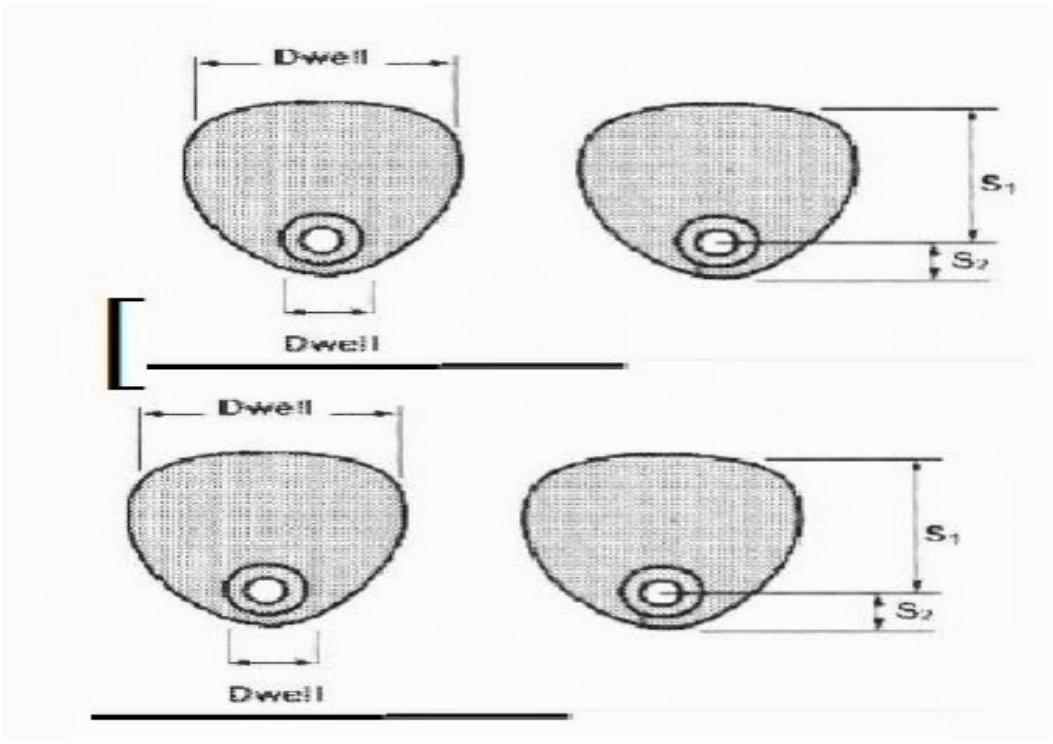
Tappet shedding uses tappets and cams to control the up/down movement of shafts.
The bulkiness of its mechanical movement limits the loom to control up to 8 shafts (repeat not more than 8)
Therefore, tappet shedding is the simplest and least versatile shedding motion.
The design is restricted to plain weave, simple twill and simple sateen or satin weave. Any design more than 8 shafts requires dobby loom.

**Negative Tappet Shedding Mechanism Construction**
Figure shows a negative tappet shedding mechanism. A pair of tappets A and B is fixed to the bottom shaft C at 180 degrees to each other. Two treadle levers D and E are connected to the loom back-rail by a bracket F. The bracket acts as a fulcrum for the levers. The two treadles have teeth to carry the lamb rods G and H respectively. Two heald shafts J and K are connected to the lamb rods. A top reversing roller shaft Q carries two rollers of different diameters. The roller of small diameter N is connected to leather strap L to which the front heald shaft J is connected. The roller P of large diameter is connected to leather strap M to which the back heald shaft K is connected. The tappets A and B touch the anti-friction bowls or followers R and S respectively, which are fixed to the treadle levers.
The heald shafts have heald eyes T and U through which the war p threads pass X is the war p sheet and Y is the cloth. The odd ends are passed through one heald shaft while the even ends are passed through the other heald shaft.




**Working Principle**

When the bottom shaft is rotated in the clockwise direction as shown in the figure, the tappets are also rotated. The tappet will depress the anti-friction bowl and the treadle. Being fulcrumed at one end, the front portion of the treadle moves down. This action is transferred to the lamb rod, the heald shaft and the leather strap. So one heald shaft is lowered and the threads connected to this heald shaft are lowered and form the bottom layer of the shed.



The leather straps attached to the reversing rollers are connected in opposite directions, i.e. when leather strap is pulled down; it is unwound from its roller. The shaft therefore rotates in the clockwise direction and the other leather strap is wound on to its roller. The heald shaft is raised and therefore the lamb rod and treadle lever are also raised. The threads connected to the heald shaft are also raised and form the top layer of the shed. For the next shed, the other tappet works with the other set of bowl, treadle, lamb rod, heald shaft, strap and roller and the other heald shaft is lowered. The first heald shaft is raised by the top reversing rollers, and the positions of the healds shafts are thus interchanged. Thus, for one rotation of the bottom shaft, two sheds are formed. In this type of tappet shedding therefore, one tappet depresses the concerned treadle and the corresponding heald shaft is lowered. But the other heald shaft is raised by means of the top reversing rollers. So this type of shedding mechanism is known as "negative tappet shedding mechanism"

**Timings and Setting:**

1. Turn the crank to the top centre position.

2. Fix the anti-friction bowls to the treadle levers; they should move freely in the slots.

3. Fix the treadle levers with a bracket to the back rail of the loom.

4. Set the grid and grid bracket to the front rail of the loom in the slots of the grid.

5. Make sure that the tappet with the lower throw is fixed to the bottom shaft at the starting handle side.

6. Fix the top reversing rollers to the top reversing roller shaft to be equidistant from the ends and at the same time ensure that the connecting screws of the rollers are symmetrical about the central axis of the shaft when the heald shafts are at the same level. The roller of smaller diameter is always connected to front heald shaft.

7. The heald shafts are connected to the top reversing rollers by means of cords and leather straps. The leather straps are connected to the rollers, such that when one of them winds on its roller the other strap unwinds from its roller and vice versa.

8. Lamb rods are connected to the heald shafts by cords.

9. Adjust the tappets on the bottom shaft and make sure of the following points:

The tappet with a bigger throw should be connected to the back heald shaft. The bowls should have perfect contact with the tappet surfaces.

The treadles should be at the same level and parallel to each other at the top centre position.

**Heald shafts:**

The hook of the lamb rod of the front heald shaft should be connected to the first notch of the treadle lever while that of the back heald shaft should be connected to the third notch. If the depth of shed is altered, the connections of the hooks to the treadle levers can be changed.

**Points to be Observed**

1. Turn the crank shaft through two revolutions and make sure that the bowls are always in contact with the tappets.
2. The heald shafts should not touch the side frames or the sley.
3. Turn the crank shaft to the bottom centre and check the size of shed. The bottom line of warp sheet or the heald eyes of the lowered heald shaft should have a clearance of 1 mm from the race board and the top.

**Positive Tappet Shedding Mechanism**

**Principle:**

In this type of shedding, the heald shaft is raised and lowered by the tappet.

**Construction**

The tappet shaft carries another tappet which has a groove or track in which a bowl is placed. The bowl is connected in turn to a tappet lever with link rods, links J and a heald shaft. Each tappet is separately connected to a heald shaft through link rods and tappet lever. There are two fulcrums for tappet lever and links

**Working Principle:**

When the tappet is rotated, the bowl is also rotated. According to the shape of the groove, the bowl is moved up or down or is still. If the bowl is moved up, the tappet lever moves to the right through the links and the heald shaft is lowered. If the bowl is moved down, the tappet lever moves to the left and the heald shaft is raised. Since the heald shaft is raised and lowered by means of the mechanism, this tappet shedding is known as positive tappet shedding mechanism. When the bowl stands still, the heald shaft is in the dwell stage.

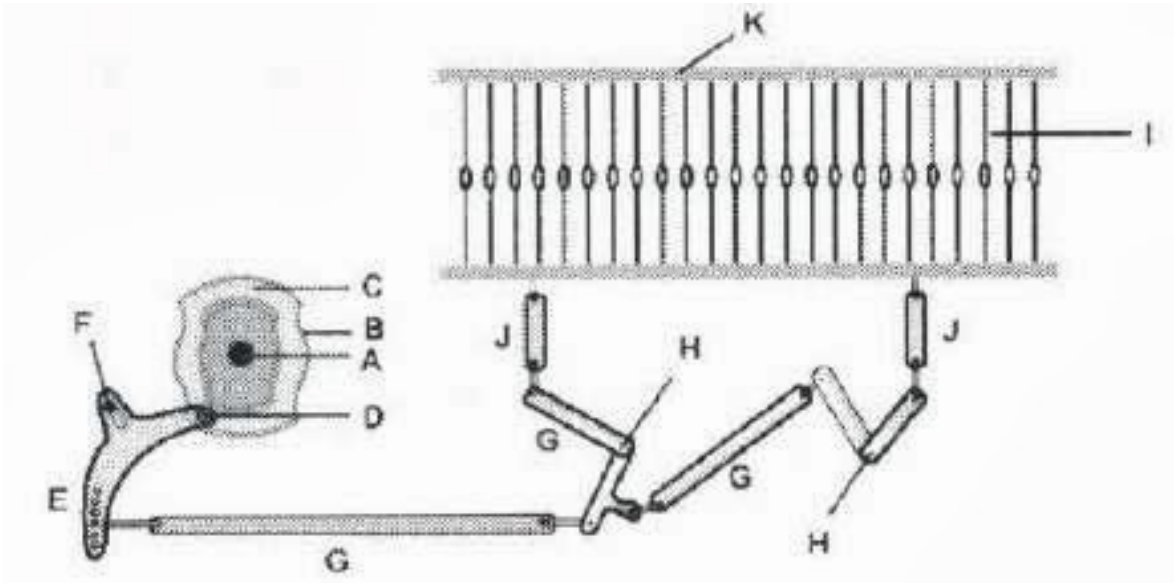



Figure: Positive Tappet shedding

A positive shedding tappet, and the one most generally employed, is known as the Wood croft tappet. This style of tappet is self-contained, and is now made in three different forms, according to the class of fabric for which it is to be adopted. .The treadles are fulcrumed on the shaft and are provided at with a knuckle, on which the antifriction pulley is pivoted. The pulleys are specially tempered or made of steel in order to better resist the friction to which they are subjected. The movement of this pulley and at the same time the treadle is determined by the shape and the arrangement of the section plates i to 12. In this type of tappet only two different section plates are used.

That shown at it is employed to raise the treadle; that is to depress the treadle. The pulley is actuated by the projecting rims of metal cast on the side of the plates with which it is in constant contact. The healds are connected to jack levers placed above and below the healds ; the levers extend outside the loom frame,and in turn are attached to the end of the treadle by means of the connector. When the treadle is forced upwards by means of a section plate, the heald shaft is drawn down, and vice versa, with the section plate.

These tappets are made to work with from 8 to 12 treadles, and can be constructed for weaves containing up to 24 picks to the round. A tappet contains 12 sections or picks in one repeat. The tappet shaft is supported in open bearings in the framework, and secured to this shaft the tappet wheel, containing a number of teeth (in this 180) which is a multiple of the weaves for which the tappet may be required. The wheel is also fitted with a number of standard bolt holes, in order to accommodate section plates of different sizes, such as are required for weaves containing a varying number of picks to the round.

**Advantages and Disadvantages of Tappet Shedding:**

**Advantages:**

1. It is robust, simple and cheap
2. It is capable of lifting a heavy weight with less wear and tear than other shedding mechanisms.
3. It can move heald shafts at great speeds.
4. It puts less strain upon the warp.
5. It consumes less power and gives greater output.
6. It requires less maintenance

**Disadvantages:**

1. If the weave is changed, it will be necessary to change the tappet and the change gear wheel in the counter shaft arrangement. So work involved in changing the weave is more.
2. The capacity of a tappet to produce a pattern / weave is ver y much limited. A maximum of 8 or 10 tappets only can be used.

**Faults that may occur in Tappet Shedding Mechanism:**

1. If the tappet is faulty, it imparts a jerky movement to the heald shaft.
2. The tappet should always touch the bowls. Otherwise a severe blow is applied to the bowl and the vibration is transmitted to the heald shaft. End breakages may occur a resultof this.
3. Over shedding: If the depth of a shed is too much, strain on the warp will be more and end breakages may occur.
4. Under shedding: If the depth of shed is too low, the shuttle will not reach the other end and may be trapped in the shed or may fly out. Hence end breakages will occur.
5. Uneven shedding: Uneven shedding is caused by lifting one end of the heald shafts more than the other so the shuttle may move over some war p threads and fly out or get trapped in the shed.
6. If the shedding is mistimed, then other motions like picking and beat-up cannot be done smoothly and end breakages may occur.

**Comments:**

Tappet shedding mechanisms produce the shed by using the reciprocating motion of the tappet. Some faults are involved in this mechanism. If this Faults are removed we can get the good result from the tappet shedding mechanism.

**Dobby Shedding**

This is a compact, electronically guided shedding motion and capable of having up to 28 shafts. More complex and versatile shedding motion. A dobby loom, therefore, can have up to 28 shafts, and much greater weave repeat is possible. Design may be woven with two or more basic weaves and their variation. Such fabrics may be referred as dobby cloths or dobby weave, towels usually show geometric designs when pattern is provided by dobby.

**Scope of Dobby:**

1. It can produce more complex design.
2. Theoretically it can control maximum 48 heald frame but practically 36.
3. For cotton yarn it can control maximum 48 heald frame.
4. Production is less than tappet.

**Principle of Negative Dobby Shedding:**

In this type of shed, lowering of the heald frame occurred mechanically.

**Construction:**

In the negative shedding the heald frames are operated by the jack & lever. The levers are connected with the knife and the knifes are attached with the driving rod by means of connecting needle. A pattern is used

here according to the weave plan. When the teeth of chain is come to the contact of chain drum then whole the arrangement moves together and lowering of the heald frame is occurred by the spring.

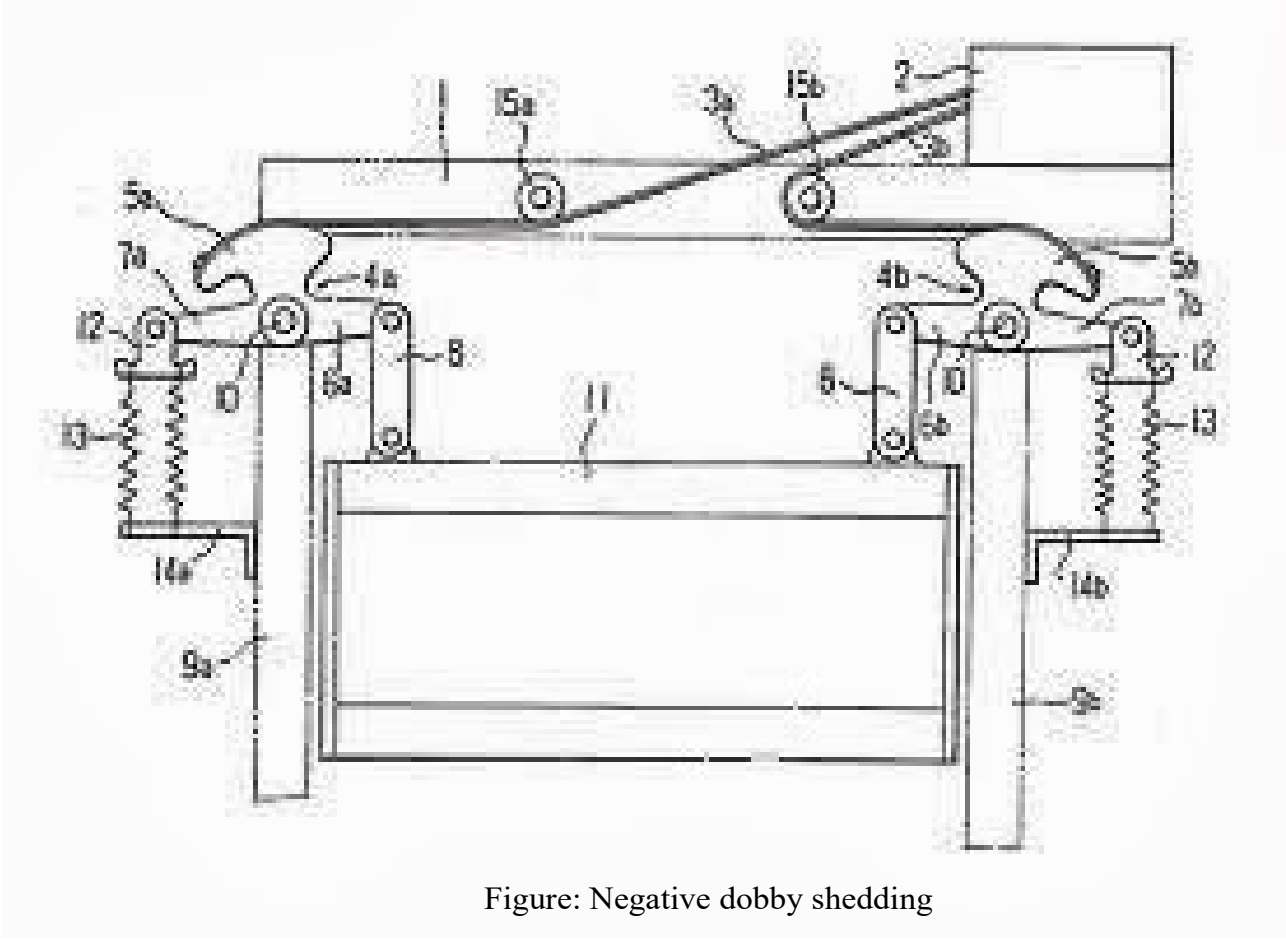



Figure: Negative dobby shedding

**Working Principle:**

The lowering of the heald frame is happens here by spring or jack lever. When the pattern cylinder doesn't find peg on the pattern drum then bauck lever and jack lever bring the heald frame in downward direction, therefore the the lowering of the heald frame is occurred by means of spring tension.

**Advantages of Negative Dobby:**

1. Highly complex and critical fabrics can be weaved.
2. At a time it can control many heald frame
3. Faste than the positive dobby as well as over conventional loom
4. Can produce close bottom shed

**Disadvantages of Negative Dobby:**

1. In this shed only lowering of the shed is possible Due to more stress, yarn breakages more
2. It is not good for heavier fabric
3. It does not provide more high speed to the loom

**Positive Dobby Shedding**

Principles of positive dobby

In this type of shed lifting & lowering of the heald frame both is possible. Lifting is occurred by means of jack & lever, and lowering is occurred by means of spring under tension.

**Construction and Working Principle:**

Positive dobby shedding is the combination of three Cylinders, jack lever, spring and a shaft. Between the three cylinders a shaft is fulcrum in one side the upper cylinder moves as the anti clockwise and lower cylinder moves as the clock wise direction. The main cylinder when get motion from the shaft when it found peg or pattern plan then the cylinder attached with the upper half toothed disc. So that the heald frame is up,& when the pattern cylinder doesn't found peg then the main cylinder attached with the lower half toothed disc and the spring retains the heald frame to the downward direction.

**Jacquard Shedding:**

To provide with unlimited design width, jacquard shedding is needed. This shedding motion has no shafts, instead, a hardness consisting of as many cords as there are ends in the warp sheet connects each end individually to the jacquard machine. Each warp could weave independently of all others. Complex and most versatile shedding motion. Biggest weave is possible with jacquard shedding as each warp yarn may be individually controlled.

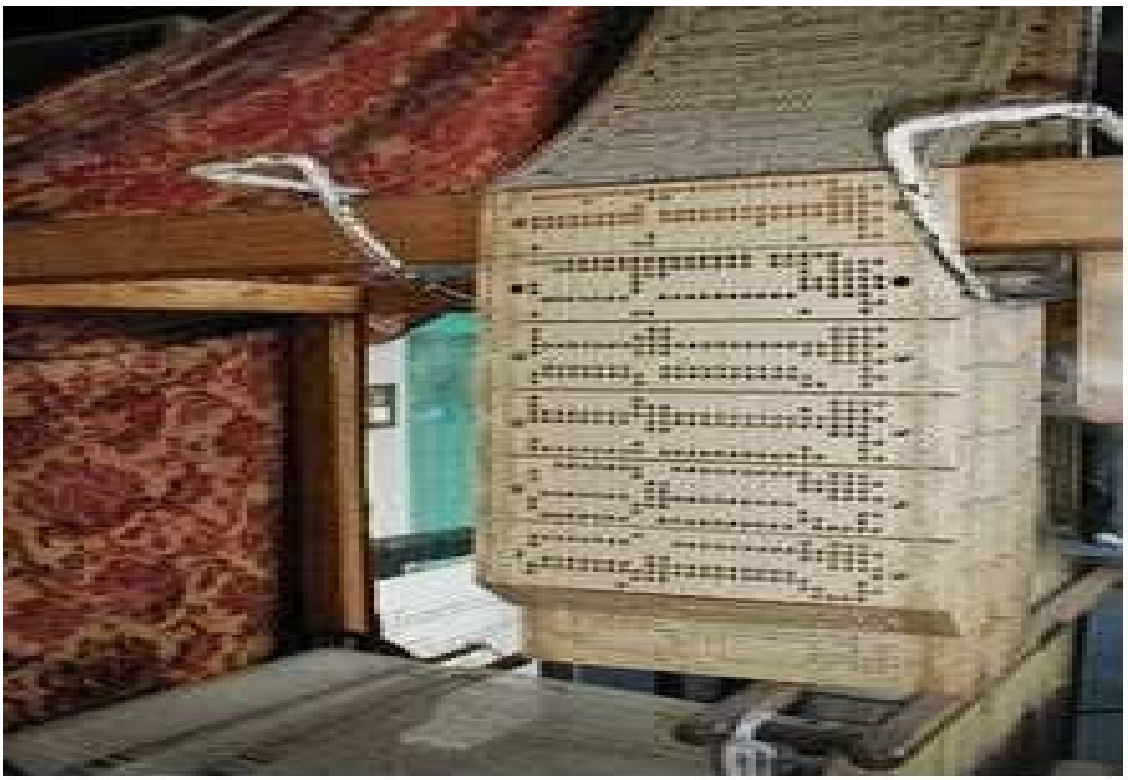


Figure: Jacquard loom with punch card

**Scope of Jacquard Shedding:**

1. No heald frame is used
2. Harness is used to lift & lower the warp thread One warp thread for each harness
3. Most complex design is produced Maximum no. of warp yarn it can control.
4. Jacquard Shedding Process

A Jacquard attachment has blades, hooks, needles, a griffe, griffe hooks, and a perforated cylinder. The warp strands, drawn through the heddle eyes, are tied to the loom by harness cords, which are threaded through a comber board for even distribution over the width of the loom. The blades set in a blade frame, move up and down. The hooks that are near the blades are engaged by them and lifted up, and the warp strands are also lifted by the griffe hooks and harness cords to form the upper part of the shed (the warp yarn in the fabric). Hooks that are out of reach of the blades drop, together with the griffe. The hooks and

the warp strands drop because they are attached to weights. The lowered strands of the warp yarn form the lower part of the shed (the woof yarn in the fabric). The hooks coming from the area of the blades' action are drawn out by needles activated by the cylinder, which in turn has a rocking and rotating motion. A piece of cardboard consisting of individual paper cards is placed on the cylinder. These cards have perforations, and when a needle comes to a perforation it enters the cylinder and the hook stays near the blade, but when a needle does not meet a perforation it is pushed back and the hook is kept away from the knife. By combining perforated and un perforated places on the cards it is possible to exercise complete control over the raising and lowering of warp strands and to form a design on the fabric.

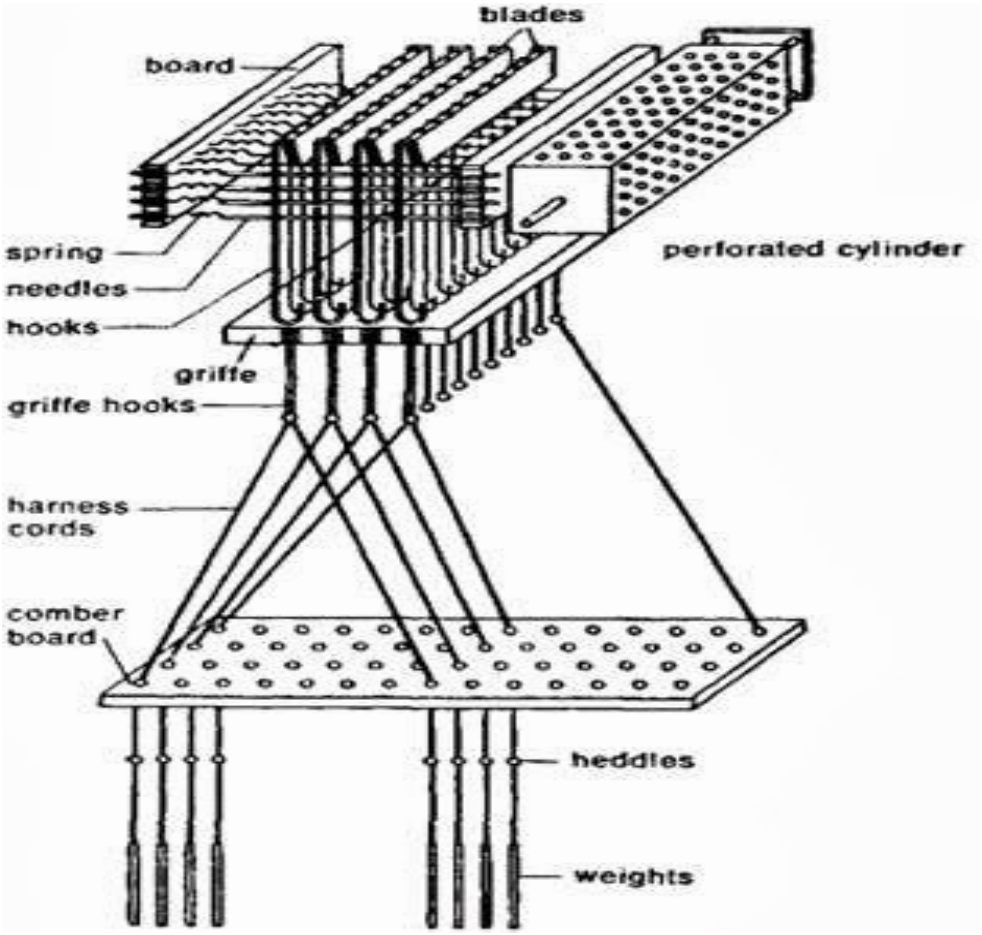



Figure: Jacquard shedding mechanism

**Advantages of Jacquard Shedding**

1. Jacquard shedding mechanisms are capable of producing large and intricate weave designs that are beyond the scope of dobby shedding mechanisms.
2. In jacquard weaving, it is possible to control every warp yarn individually.
3. Many specialized types of jacquard machine have been developed for weaving particular kinds of fabric, such as terry towels, damasks, and carpets.
4. Most of the rest are general purpose types that are comparatively easy to classify.