3.1 Introduction

The Jacquard is a shedding device used to produce large figures or patterns that are beyond the capacity of a dobby system. A Jacquard system is usually located above the loom and controls a large number of warp threads independently by means of harness cords, hooks and needles. Each hook in a Jacquard represents a single heald.

The Jacquard system was invented in the year 1801 by a French weaver named Joseph M. Jacquard and was first exhibited at a National Exhibition of Paris.

3.2 Types of Jacquard

Jacquard systems are generally classified into six distinctive groups:

1. Single-lift Jacquard
2. Double-lift Single-cylinder Jacquard
3. Double-lift Double-cylinder Jacquard
4. Double-lift Single-cylinder Single hook Jacquard for high speed weaving
5. Electronic Jacquard
6. Jacquards for special use, viz. Cross-border Jacquard, Twilling or Damask Jacquard, Leno Jacquard, Fine-pitch Jacquard.

3.3 Single-lift Jacquard

The single-lift Jacquard is simple in construction and is adopted for weaving in hand-looms. The single-lift Jacquard loom is built upon the principle of bottom-closed shed and is not suitable for high speeds. It is preferred in the manufacture of silk fabric, as the beating up is done in a closed shed, an arrangement that is essential for silk weaving as little damage is caused to the yarn. The machine is also suitable for leno weaving, as the shaking motion to enable the crossing ends to cross is not necessary. In any case, it is very difficult to install a shaking motion in a double-lift Jacquard.

3.3.1 Principle of Single-lift Jacquard

The principle of single-lift Jacquard is shown in Figure 3.1. For lifting the warp threads only one hook, a needle, a cylinder and a knife are used. The knife is at the bottom. A card of the perforated four-sided cylinder is pressed against the needle. If there is a hole in the card, the needle opposite the hole will pass through it and into the perforation in the cylinder. In this case the position of the hook above the knife is retained as it is. When the knife moves up it carries the hook and the warp thread connected to it is also lifted.

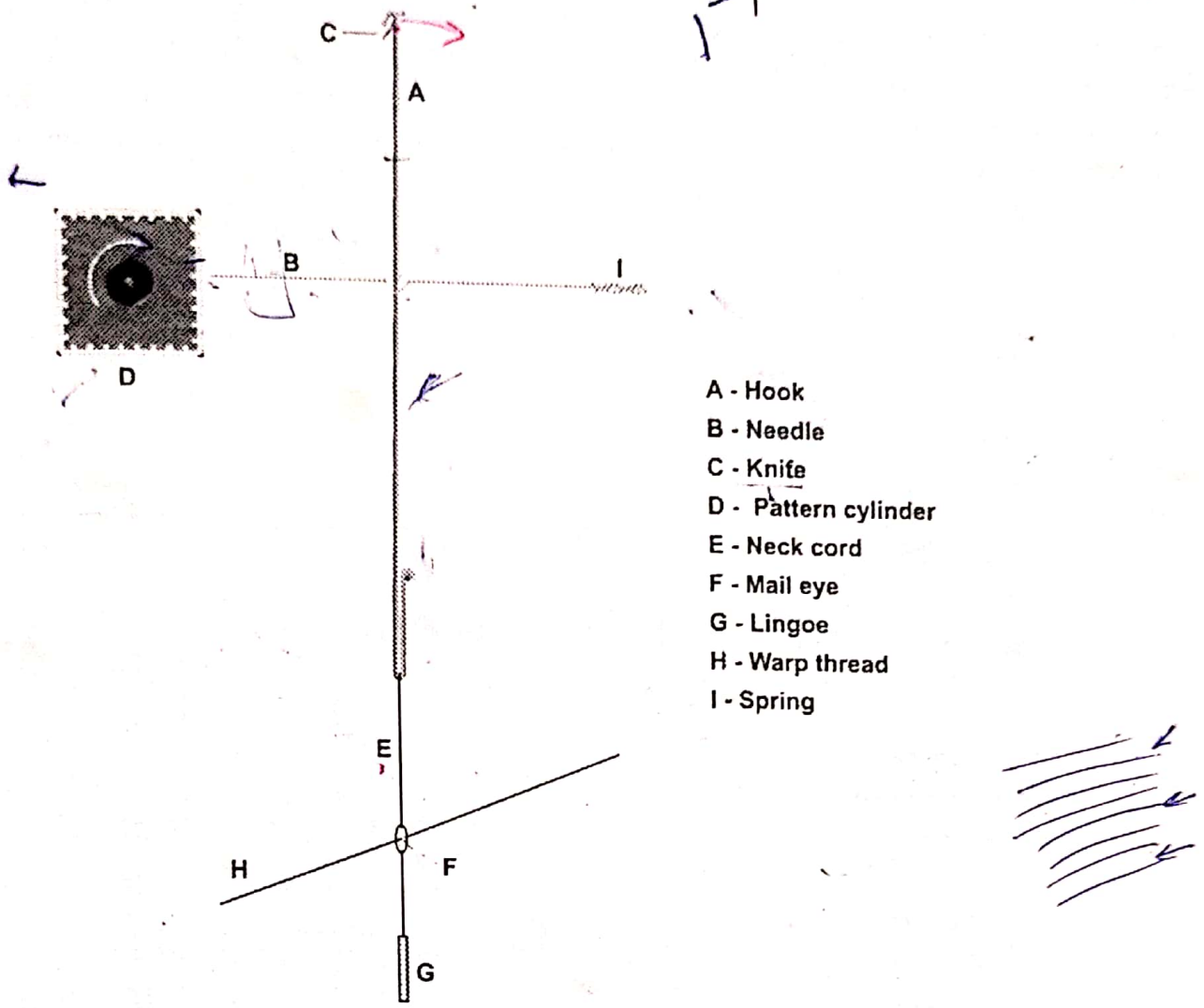


Figure 3.1 Principle of Single-lift Jacquard

If the same warp thread is required to be lifted up for the next pick, the same hook comes down and lifts the same warp thread again.

A blank opposite to the needle presses it back and so the hook is deflected from the knife; as the knife goes up it leaves the hook at the bottom position.

3.3.2 Construction of a Single-lift Jacquard System

The arrangement of a row of hooks and needles, a needle-board and a spring box of a single-lift Jacquard is shown in the Figure 3.2. The needle-board is a perforated board through which the needles pass. Each needle is bent around its respective hook. At the back of each needle is placed a small, fine brass spring. These springs are held in position in the spring-box.

The hooks are bent at the bottom and placed on a grate. The bottom of the hook rests on the perforations of a tug board. Short but strong cords of twine are connected to the bottom of the hooks and passed through the perforation of the tug board. The cords are technically called tug cords or neck cords. The grate and the bottom board are used to prevent the hooks from turning round.

The eight knives close to the top ends of the hooks are all fastened together and form the griffe. The griffe is connected to the crankshaft through an eccentric wheel to receive an up-and-down movement. A four-sided pattern cylinder is fixed near the needle-board. The cylinder is reciprocated and rotated by means of suitable links with the crankshaft.

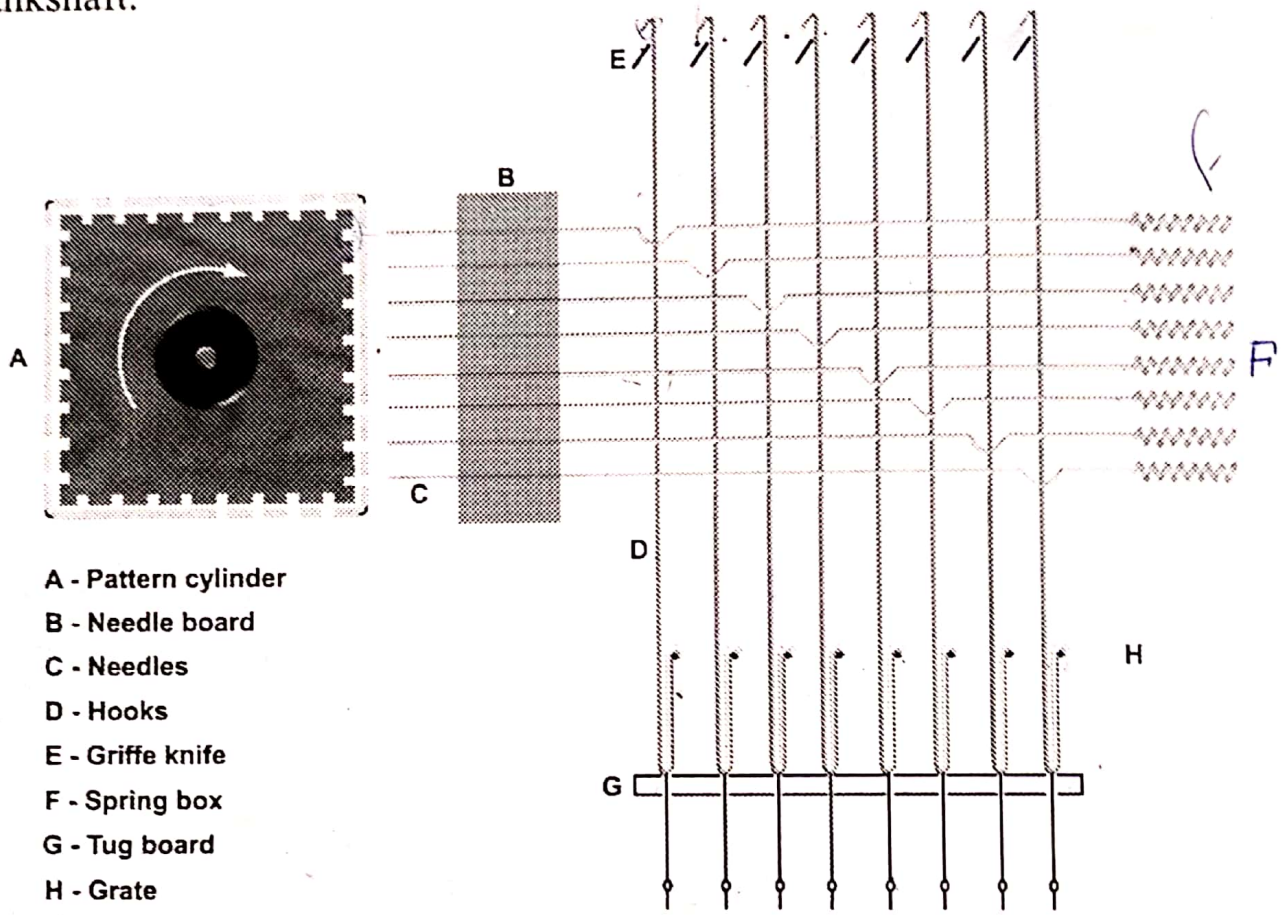


Figure 3.2 Single-lift Jacquard

In the CD-ROM, watch Animation No. WFP - II 3.1

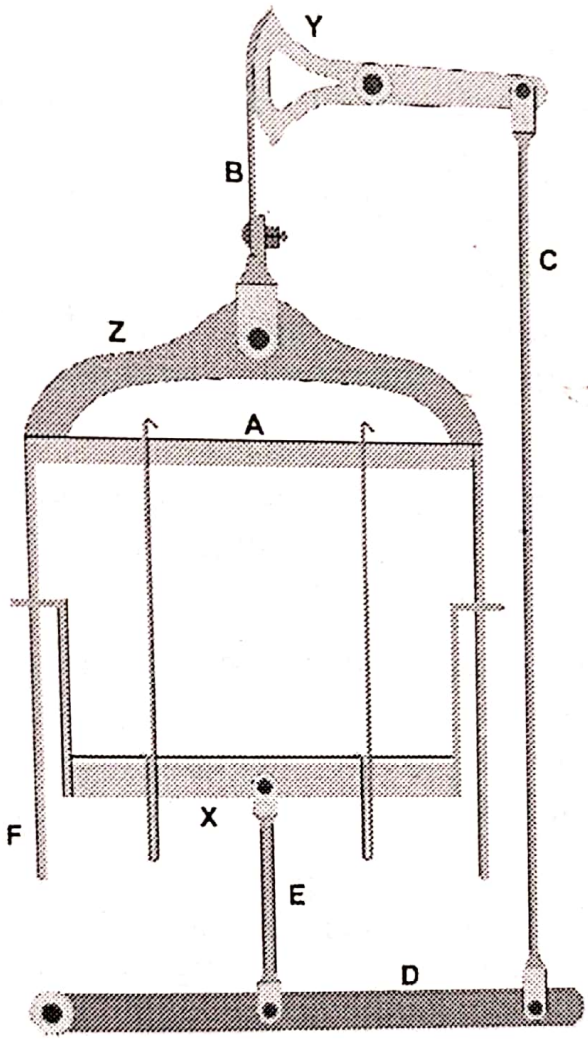
Figure 3.2 shows the knives at the lower end of their stroke. In this situation, the perforated four-sided cylinder with the punched card is pressed against the needles. It may be noted here that the punches on the card are made on a separate punching machine and depend upon the design to be woven. Needles that are opposite to the holes in the card enter them, thereby causing the concerned hooks to engage with the knife. Needles that are opposite to the blank spaces are pushed back and the respective hooks are disengaged from the knives.

It is clear from the above that the knives lift all the selected hooks as they move upward and leave behind all the unselected hooks at the lower level. It is thus possible to lift any of the hooks in the Jacquard for any pick. When the cylinder is moved away from the needles, the hooks are forced back into their original positions by the small springs in the spring box. In this type of Jacquard the bottom line of shed is a fixed line and is retained by the dead weights called `lingoes'.

In a Jacquard the knives are not mounted in a perfectly vertical position but are slightly slanted. If they were oriented vertically, they would hit the tops of the hooks while moving down and could break or bend them. The slanted arrangement helps the knives to push the hooks sideways fairly smoothly and move easily under them. The knives are expected to move to a low enough position and be clearly away from the hooks. In the single-lift Jacquard therefore, a considerable dwell is maintained when the shed is closed.

3.3.3 Centre-Shed Jacquard

The centre-shed Jacquard was invented in 1876 by Finely. The conventional bottom-closed single-lift Jacquard runs at a slow speed because the shed takes a longer time to open. As the counterpoised principle is not involved in lifting or lowering the harness, greater strain is imposed upon the harness.



A - Knife
B - Strap
C - Upright rod
D - Bottom lever
E - Rod
F - Spindles
X - Grid
Y - Quadrant lever
Z - Griffe

Figure 3.3 Centre-shed Jacquard

The centre-shed Jacquard eliminates these two faults. The arrangement of the card cylinder, needles, hooks, neck cords and harness cords of a centre-shed Jacquard is the same as that in a single-lift conventional Jacquard, except the arrangements of the rising knife and the falling grid. Figure shows the construction of a centre-shed Jacquard. A is a knife of the griffe Z. This is connected to a quadrant lever Y by

means of a strap B. The upright rod C connects the bottom lever D, and a similar rod E connects the grid X to the bottom lever. When the knives ascend, the grid descends simultaneously, by means of the connections of quadrant lever, upright rod C and the bottom lever. The ascending knife raises the selected hooks and the descending grid lowers the remaining hooks that are not selected. Therefore a shed is opened in about half the time required to form one by a single-lift Jacquard. When the motion is reversed, the knife and the grid move towards each other and so the warp threads meet at the centre. The action of grid is steadied by the pair of spindles F fitted to the griffe frame.