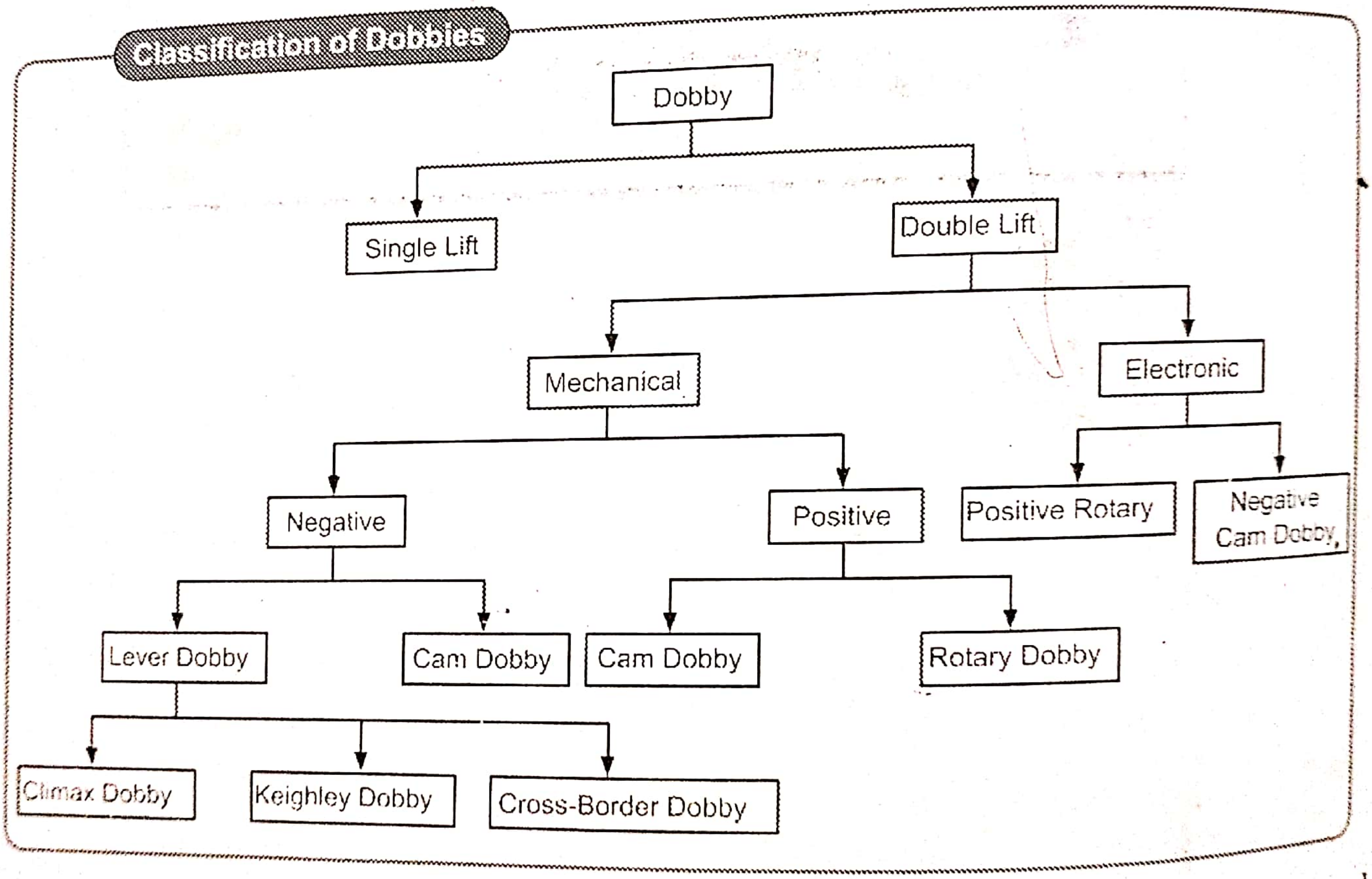
1.1 Introduction

A 'dobby' is a shedding device attached to a loom for producing a variety of small motifs (designs or patterns). The capacity of a dobby system is more than that of a tappet system in terms of the number of heald shafts that can be operated and the number of picks that can be inserted per repeat of the design. Technologically speaking, tappet systems produce a better quality of cloth than do dobby systems. In other words, healds work better and last longer with tappet systems than with dobby systems.

1.1.1 Classification of dobby systems



Dobby systems are classified as negative or positive, single-lift or double-lift and cam-driven or crank-driven. They form bottom-closed, centre-closed, semi-open and open types of sheds.

Dobby systems may also be classified as left-handed or right-handed. A right-hand dobby is one that is placed at the left-hand side of a right-hand loom; it gets its drive from the left-hand end of the loom. In the same manner, a left-hand dobby is one placed at the right-hand side of a left-hand loom. A left-hand dobby gets its drive from the right-hand end of the loom.

A positive dobby activates the heald shafts in both the directions, up and down. It is used for producing heavy fabric in woollen and worsted weaving.

A negative dobby activates the heald frames in only one direction, i.e. upward or downward. Movement of the heald frames in the opposite or reverse direction is brought about by means of under motions using springs or elastic bands. A negative dobby is used for the production of light and medium-weight fabric in cotton, silk or synthetic yarn weaving.

A dobby that drives a T-lever to move the knives is driven mostly by a crank fixed to the bottom shaft in the case of double-lift dobby systems or by a crankshaft in single-lift dobby systems. Such systems are called swing-lever dobbies. In cam dobbies, cams are used for moving the knives.

1.1.2 Tappet and Dobby shedding - a Comparison

Table 1.1

S.No	Tappet Shedding	Dobby shedding
1.	Tappet shedding is simple and cheap in construction.	Dobby shedding is relatively complicated.
2.	Tappets produce simple and basic designs using a maximum of only eight heald shafts.	A dobby can produce small motifs using many more heald shafts up to a maximum of 40.
3.	A tappet loom works efficiently and consumes less power.	A dobby loom consumes more power.
4.	A tappet loom can be run at high speed with less machine vibration.	A dobby loom cannot be worked at high speed because of high machine vibration and excessive friction between moving parts.
5.	Tappets are required to be changed for altering the design. Gearings on the bottom and counter shaft are to be altered.	The designs can be modified easily. Change over is brought about quickly and does not require any major alterations.
6.	The number of heald shafts used and picks/repeat cannot be changed for a given set of tappet.	The number of healds and picks/repeat can be easily altered.
7.	In tappet shedding dwell period is maintained for the safe passage of shuttle.	In swing lever dobbies there is no dwell period. In a cam dobby, a dwell is maintained.

1.2 Single-lift Dobby

In a single-lift dobby, the selection of a hook for lifting a given heald frame takes place once for every pick. All the moving parts are thus involved in a series of movements during which time one pick is inserted. As each heald frame has its own individual hook that can be caused to raise the heald frame, this type of dobby gets the name `single-lift' dobby.

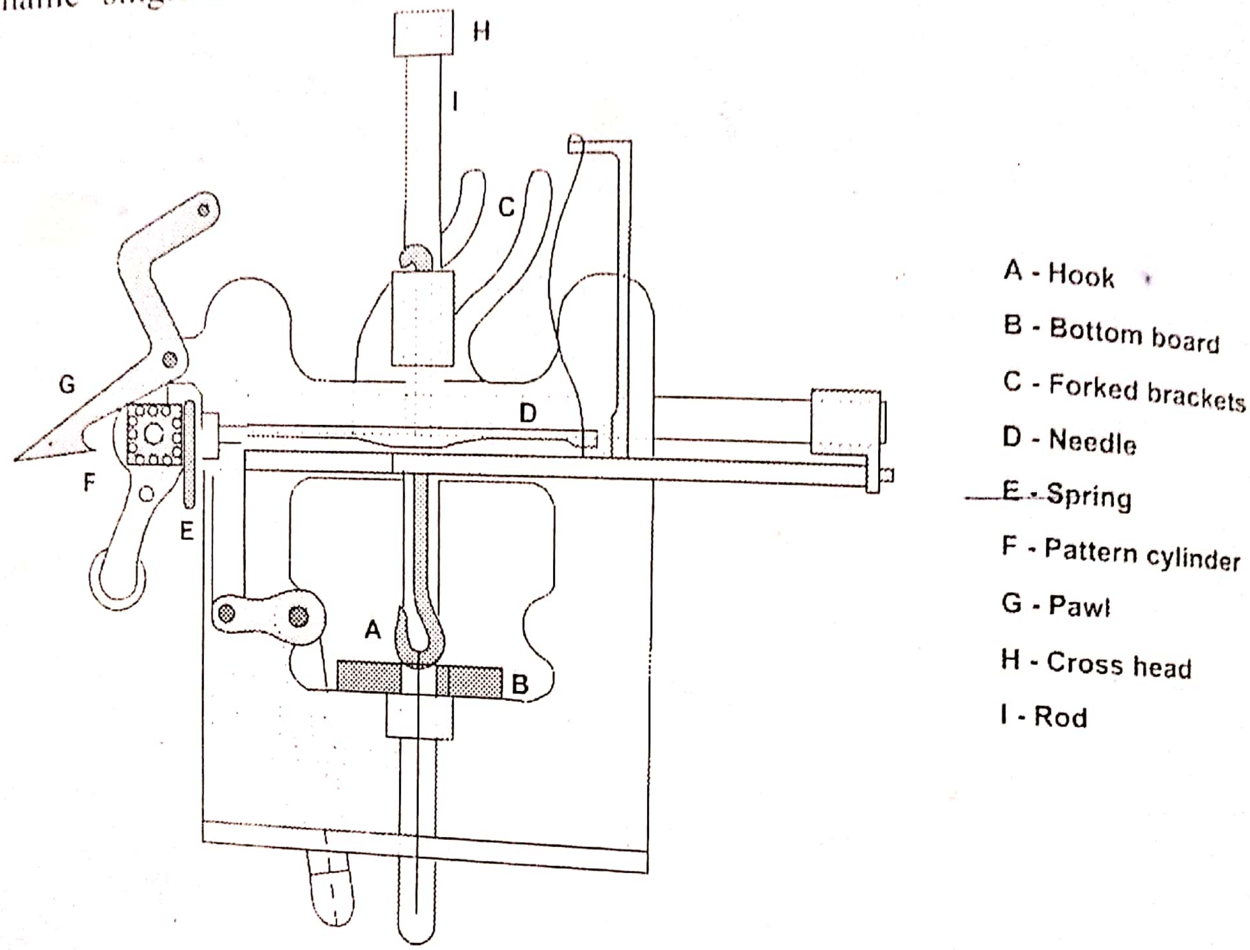


Figure 1.1 Single-lift dobby

The single-lift dobby is generally used in the weaving of silk and rayon fabric and also certain types of gauze fabric. In this dobby, the weft is beaten up in a closed shed, a feature that is so essential to silk weaving in ensuring minimal friction in the warp threads. The single-lift dobby loom is preferred for certain types of gauze fabric because it produces a bottom-closed shed that avoids the use of a shaker motion.

1.3 Double-lift Dobby

Most of the dobby systems in use today, especially those in the cotton industry, are based on the double-lift principle. These systems are so designed that two hooks control every heald shaft independently. Hence the name, double-lift dobby.

1.3.1 Characteristics of a Double-lift Dobby

1. A double-lift dobby forms an open shed.
2. The weft is beaten up in a crossed shed.
3. Each heald frame is controlled independently by a pair of hooks, one at the top and the other at the bottom.
4. Drive from the bottom shaft of the loom activates the dobby.

1.3.2 Advantages of a Double-lift Dobby

1. In a double-lift dobby all the moving parts are involved in a series of movements during which two successive picks are inserted. Hence the time available for selecting any given hook is twice that available in a single-lift system.
2. A shed is produced in less time than in a single-lift dobby and with the least amount of strain on the warp.
3. There is less wear and tear of the working parts.
4. The rising and falling healds work in better equilibrium in a double-lift dobby system.
5. A loom with a double-lift dobby works more steadily than one with a single-lift dobby.
6. The weft is beaten up in a crossed shed and so a greater number of picks can be inserted per unit length.

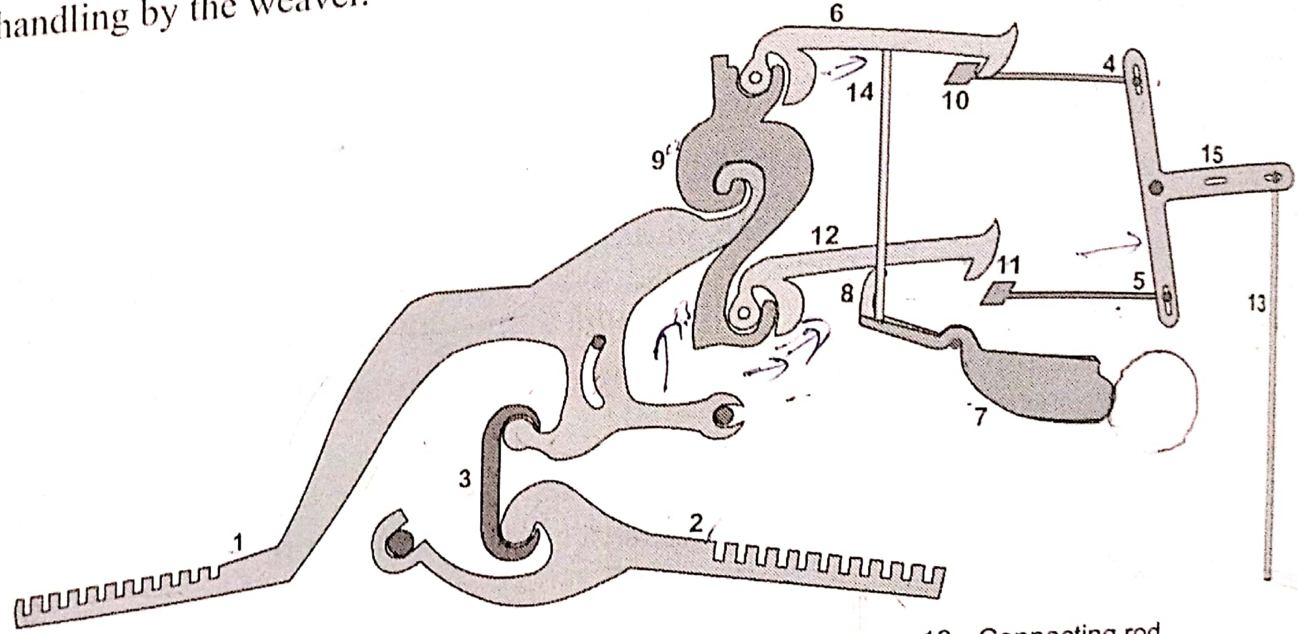
1.3.3 A Comparison of Single-lift and Double-lift Dobby Systems

Table 1.2

S.No	Single-lift Dobby	Double-lift Dobby
1.	The dobby operates once for every pick.	A double-lift dobby operates once for every two picks.
2.	The dobby is connected to the crankshaft.	The dobby is connected to the bottom shaft.
3.	The dobby gives a stationary, bottom-closed shed.	This dobby gives an open shed.
4.	The dobby systems are very slow and cause more wear and tear and vibration of parts.	Double-lift dobby systems operate faster with less wear tear of the parts.
5.	They are used for weaving light and medium weight fabric of silk, rayon, etc. and also for special fabric such as gauze.	These systems are used for weaving cotton fabric.

1.3.4 Climax Dobby

The climax dobby can be classified as a horizontal, negative, double-lift, double-jack, lever dobby. It is placed at one end of the loom at a suitable height for convenient handling by the weaver.



1 - Outer jack
2 - Inner jack
3 - C Lever
4,5 - Draw bolts
6 - Top hook
7 - Straight feeler
8 - Bent feeler
10,11 - Griffe knife
12 - Bottom hook
13 - Connecting rod
14 - Upright rod
15 - T - Lever

Figure 1.2 Climax dobby **In the CD-ROM, watch Animation No. WFP - II 1.1**

The principle of this dobby is illustrated in Figure 1.2. A connecting rod (13) connects an T-lever 'crank' attached to the bottom shaft of the loom to the T-lever (15), as shown. Two draw bolts (4 and 5) are attached to the T-lever. The ends of the bolts hold two draw knives; one is the upper knife and the other is the lower knife. It may be seen that rotation of the bottom shaft will cause the L-lever also to rotate and this in turn will help the two knives to move alternately one way or the other, due to the oscillatory movement of the T-lever. There are two hooks operating above the top and bottom knives; one is the top hook (6) and the other the bottom hook (12). These hooks are connected to the S lever (or baulk lever) and can be caused to engage or disengage the corresponding knives. The C-link (3) connects the outer jack (1) and the inner jack (2). The heald shaft is connected to the two jacks by means of cords.

The arrangement of all these parts is made in such a way that the heald shaft can be raised or lowered. For example, if the bottom hook is caused to engage the bottom knife when it is in the innermost position (i.e. towards its left) and then the knife is moved outwards (i.e. towards the right), it carries the bottom hook outward (i.e. towards the right) and causes the heald shaft to be raised. The shed is now fully open.

The top knife is now at its innermost (i.e. extreme left) position for producing the next shed. This is achieved by causing the top hook to drop and engage the top knife. Next, the top knife begins to move in an outward direction carrying the hook with it and the heald shaft is raised.

In both the cases the heald frames connected to the hooks that are not dropped to engage the corresponding knives are not lifted up. In order to lift the required heald frames for producing a shed, it is necessary to first select the appropriate hooks and cause them to drop and engage the corresponding knives. The selection of hooks is achieved by an arrangement of feelers, a pattern cylinder, lags and pegs.

1.3.5 Selection of Hooks for Climax Dobby

Two feelers, a straight feeler and a bent feeler, are used for raising or lowering the top and bottom hooks respectively. These feelers have their fulcrums on a rod, as shown in Figure 1.3. The bottom hook rests on the upright arm of the bent feeler. The top hook is connected to the straight feeler by means of an upright rod (14). Both the feelers are weighted sufficiently at the back to make them fall under their own weight when free.

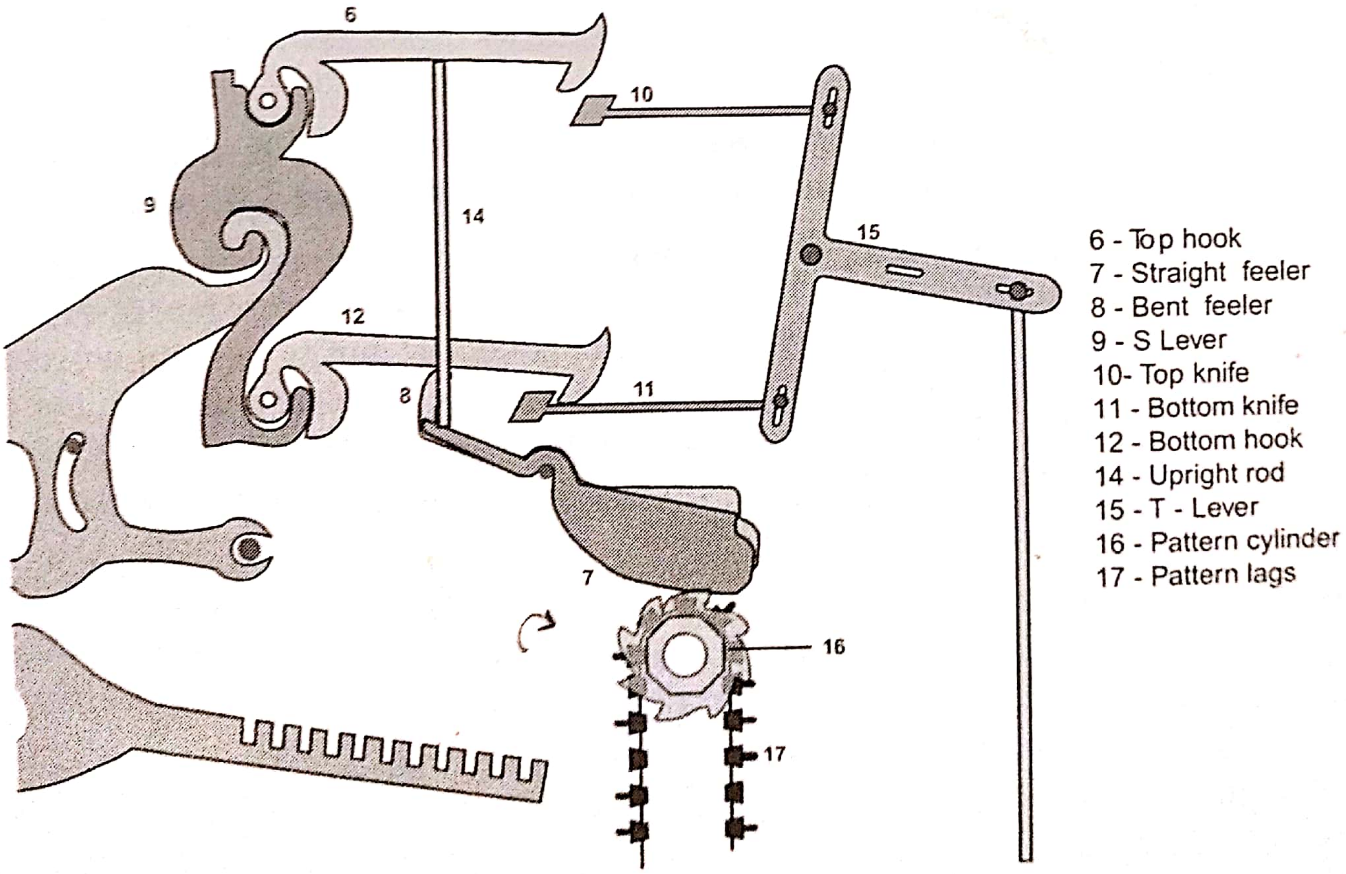


Figure 1.3 Selection of hooks

Lifting the left-hand end of either of the feelers by lowering the right-hand end raises the hook clear of the corresponding knife. Similarly, lowering the left-hand ends of the feelers by lifting their right-hand ends drops the hooks, engaging the corresponding knives. Thus the oscillatory movement of the feelers about their common fulcrum engages or disengages the hooks and the knives.

Close to and below the feelers is an eight-face pattern cylinder over which traverses a wooden lattice, as shown in Figure 1.3. The pattern cylinder and the lattice rotate in the clockwise direction. The lattice consists of lags (17) (which are uniform strips of wood) that are pegged at appropriate holes with wooden pegs. If, as the lattice moves, one of the pegs in a given lag raises the right-hand end of a feeler, it naturally brings down its left-hand end. This action causes the hook connected to it to lower itself on to the corresponding knife. On the other hand, a blank space in the lag does not cause any movement in the feelers, so the hook remains in the raised position, off the knife below it.

The lags on the pattern cylinder or barrel have double rows of holes. The pegs in the holes act on both the bent and straight feelers. The cylinder remains stationary for two picks and is then turned $1/8^{th}$ of a revolution, by means of a pushing pawl, to bring the next lag below the feelers. An eight-toothed ratchet wheel attached to one end of the cylinder shaft turns the cylinder. The lags and pattern barrels are kept steady by a flat spring bolted to a star ring fixed to the barrel shaft (not shown in Figure 1.3).