SHEDDING

DOBBIES

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Dobby mechanisms

- are more complicated than cam systems,
- have higher initial and maintenance costs,
- can produce more sophisticated weaves,
- are normally built to control 12, 16, 20, 24, 28 up to 30 heald frames.
- Picks per repeat are virtually unlimited in dobbý shedding.
- Due to their complexity, dobbý mechanisms are more liable to produce fabric faults than cam systems.
Dobby mechanisms

- Dobby mechanisms are classified as negative, positive and rotary dobbies, they can be mechanical or electronic.

- In negative dobbey shedding, the harnesses are lifted by the dobbey and lowered by a spring reversing motion.

- In positive dobbey shedding, the dobbey both raises and lowers the shafts.

- Today, the trend is away from negative dobbey to electronically controlled positive dobbey mechanisms, which can operate at very high speeds.
Dobby mechanisms

- Depending on their performance they are divided into single-lift and double-lift dobbies.

- **Single-lift dobbies** are the oldest.
  - All system elements perform their function once every weaving cycle to open a shed, and then they return to their original positions before a new cycle.
  - The shed is closed after every weft insertion and the pick is beaten up at the closed shed (center-closed shed)
  - Advantageous in the wool weaving in the past.
  - The speed of single-lift dobbies is limited to 160 to 180 rpm.
Dobby mechanisms

- **Double-lift dobbies:**
  - All new type dobbies are double-lift in their action.
  - Its cycle occupies two picks.
  - System elements operate once every two weaving cycles, but the shed opening is achieved every pick.
  - Most of the motions in dobbey occur at half time loom speed.
  - Open shed is produced; unnecessary, wasted movements are eliminated.
  - Suitable for high speed operations.
Dobby mechanisms

- The dobbay consists of three principal mechanisms:
  - The drive mechanism: An auxiliary shaft is permanently driven from the weaving machine.
  - It operates two steel bars (knives), having a regular reciprocating motion or
  - It operates coupling rings on a rotary dobbay.
  - The selection mechanism: It is operated by dobbay card (or by some form of pattern chain)
  - It reads or checks the design information punched on a dobbay card, and
  - transmits the necessary movement from the drive mechanism to the lifting mechanism.
- The lifting mechanism operates the heald shaft motion.
Keighley Dobby (negative dobbý)
Card Cylinder

Card cylinder for a modern dobby mechanism (courtesy of Staubli).
Card cutting and copying machines

FIGURE 6.16 Motor driven card cutting and copying machine: left, front of the machine; right, back of the machine (courtesy of Staubli).
Card cutting and copying machines

FIGURE 6.17 Copying (left) and pasting devices (courtesy of Staubli).
Heald shaft connections for negative dobbies
Placement of negative dobbay

FIGURE 6.19 Placement of negative dobbay (courtesy of Staubli).
Heald shaft connections for negative dobbies

- Type of connections which necessitate the **positioning of bearings, and of numerous metal parts** in rubbing contact with each other, **above the warp** may cause some problems.

- It is essential to fix a tray underneath the moving parts to catch oil drips, which are always heavily contaminated with dark-colored metallic impurities.

- Stains on the warp produced by dirty oil are very difficult to remove, and, if not completely removed, may cause tendering of the yarn during bleaching.
Spring undermotions for negative dobbies
Ruti Dobby

- Knives $K_1$ and $K_2$ are actuated by cams $C_1$ and $C_2$ mounted on the camshaft C.S.

- The cams are negative in action, and the cam followers are kept in contact with the cams by means of springs not shown in the diagram.

- The desired dwell can be obtained.

- The inclined knife track facilitates the hook engagement.

- Together with the inclined knife tracks this drive produces a more compact and efficient motion.

- This feature are commonly found on modern dobbies.
Selection Mechanism for Paper Pattern
Knowles Positive Dobby
Knowles Positive Dobby
Positive dobby (Hattersley dobby)

FIGURE 6.20 Schematic principle of positive dobby [2].
Staubli - 2212
Staubli - 2232
Staubli dobbý-Type 300

Fig. 4.32 The Staubli Dobby, Type 300
Hattersley dobbey

- Presently, only double-lift dobbies are manufactured.

- In the Hattersley system long hooks of grey cast iron were adjusted in horizontal position; they engage the knife by the effect of dead weight.

- The highest speed attained on the shuttleless weaving machine is 500 rpm, which is equipped with a modified version of Hattersley dobbey where the hook mass have been considerably reduced.

- The biggest obstacle on the way to further speed increase is the hook mass.
Rotary dobies

- In order to achieve dobby shedding at faster speeds, **new generation rotary dobies** are developed and introduced.

- A rotary dobby can allow weaving machine speeds up to 1000-1500 rpm.

- The term 'rotary' was chosen because the straight-line motion of the heald frames is derived from rotating elements in the dobby.
Rotary dobbies

- ‘A controllable crank mechanism’, known as ‘cam unit’, is built into dobbey.

- Each cam unit is of only 12 mm wide and can control one of the heald shafts.

- The **cam unit** consists of a **heart-shaped crank disc** which encloses a **cam** with **ball bearings** plus a **movable key** which is the only controlled part.
Heart-shaped crank disc

A positive dobby machine that operates on the rotary principle with pattern card control.

Fig. 4.34 High performance rotary dobby of the Series 2400
Mounting location of a rotary doby on a weaving machine.

1. Shafts
2. Jack runners

*Electronically controlled "Stäubli" rotary doby*

This doby permits weaving with up to 16 or 28 heald shafts 1.

It is controlled by entering the fabric and machine-specific parameters at the terminal. The shed opening angle is modified symmetrically by moving jack runners 2.
Rotary Dobby

Functional Principle

The high-performance rotary dobbies of Series 2600 with electronic controls operate according to the rotary principle invented by Stäubli, basically founded on two elements:

- **Cam unit**
  Each harness frame is controlled by a cam unit only 12 mm wide. This cam unit converts the irregular rotary motion of the main drive shaft directly into the linear motion required for the harness frame drive. The essential element is a crank mechanism enclosing a cam with ball bearings. A ratchet placed on the outside of the cam connects it with the driver, and by a 180° rotation of the cam causes a lifting motion. The ratchet is controlled according to the pattern by the control unit.

- **Modulator**
  The modulator transforms the regular rotary motion from the weaving machine into an irregular rotary motion. By the use of complementary cams precise laws of motion result, meeting the requirements of any type of weaving machine.
Principal mechanisms on a rotary dobbý

- **Drive mechanism (Modulator):**
  - Modulator, complementary cams, coupling ring

- The modulator transforms the regular rotary motion of the weaving machine into an *irregular rotary motion*.

- By the use of complementary cams precise laws of motion results, meeting the requirements of any type of weaving machine.

- Irregular rotary motion means that the cam shaft turns through $180^\circ$ and then pauses momentarily for a new selection.

- Coupling ring fixed on the cam shaft has the same irregular rotary movement.
Principal mechanisms on a rotary dobbey

- **Selection mechanism:**
  - A *ratchet* placed on the outside of the cam, enclosed by the crank, connects it with the driver.
  - The ratchet is controlled according to the pattern by the control unit which may be mechanical or electronic.
  - A $180^\circ$ rotation of the cam causes a lifting motion.
Principal mechanisms on a rotary dobby

- **Lifting mechanism (cam unit):**

- The essential element is a crank mechanism enclosing a cam with ball bearings.

- The cam unit is mounted on the cam shaft but not fixed.

- Cam is eccentric and can freely rotate thanks to the ball bearings.

- The ratchet placed on the outside of the cam connects it with the driver, and by a $180^\circ$ rotation of the cam causes a lifting motion.
Selection, electromagnetic control unit

ratchet

Lifting: controllable crank disc (cam unit) and jack

Drive

jack
Rotary Dobby

Fig 4.35 High performance rotary dobbey of the Series 2600
Rotary Dobby

- Jack
- Cam Unit
- Connecting Rod
- Driver
- Magnet Bar
- Selector
- Control Lever
- Rachet
Rotary Dobby
**Functional principle:**
Each harness frame is controlled by a cam unit, a compact element only 12 mm wide, which converts the irregular rotation of the main shaft directly into the linear motion required for the harness drive. The cam unit consists of a heart-shaped crank disc which encloses the cam mounted on a coupling ring, plus the key - the only controlled part. The key connects the cam with the coupling ring fixed on the main shaft and makes the cam at the end of the crank disc, which rotates in cycles of 180°, perform a lifting motion. The indexing arm controls the key according to the pattern. The reading device is a self-contained unit of very simple conception. The pullers move forwards and backwards and transmit the information read by the feeler needles via traction elements and indexing arms to the keys.

The reading device of the rotary dobbý operates true to the picking sequence, regardless of the position from which the direction of rotation is reversed. With this ingenious combination of feeler needle, traction element, indexing arm, key and cam unit - a fundamental invention patented by Staubli - a control system with unsurpassed safety factor has been created, unique in its simplicity and efficacy.
FIGURE 6.29 Functional principle of positive rotary dobbý with pattern card control (courtesy of Staubli).
FIGURE 6.28 Positive rotary dobbý with pattern card control (courtesy of Staubli).
FIMTEXTILE - RD 840
FIGURE 6.31 Schematic of shed motions (courtesy of Staubli).
M’ = middle shed position overdrawn upwards

M'' = middle shed position overdrawn downwards

1. Jack in position A
2. Jack in position A
   = pile harness frame in upper shed H

1. Jack in position B
2. Jack in position B
   = pile harness frame in lower shed T

1. Jack in position A
2. Jack in position B
   = pile harness frame in middle shed M

1. Jack in position B
2. Jack in position A
   = pile harness frame in middle shed M