SHEDDING

DOBBIES

Prof. Dr. Emel Önder

Ass.Prof.Dr.Ömer Berk Berkalp

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 dobby shedding.
- Due to their complexity, dobby 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 dobby shedding**, the harnesses are lifted by the dobby and lowered by a spring reversing motion.
- In **positive dobby shedding**, the dobby both raises and lowers the shafts.
- Today, the trend is away from negative dobby to electronically controlled positive dobby 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.

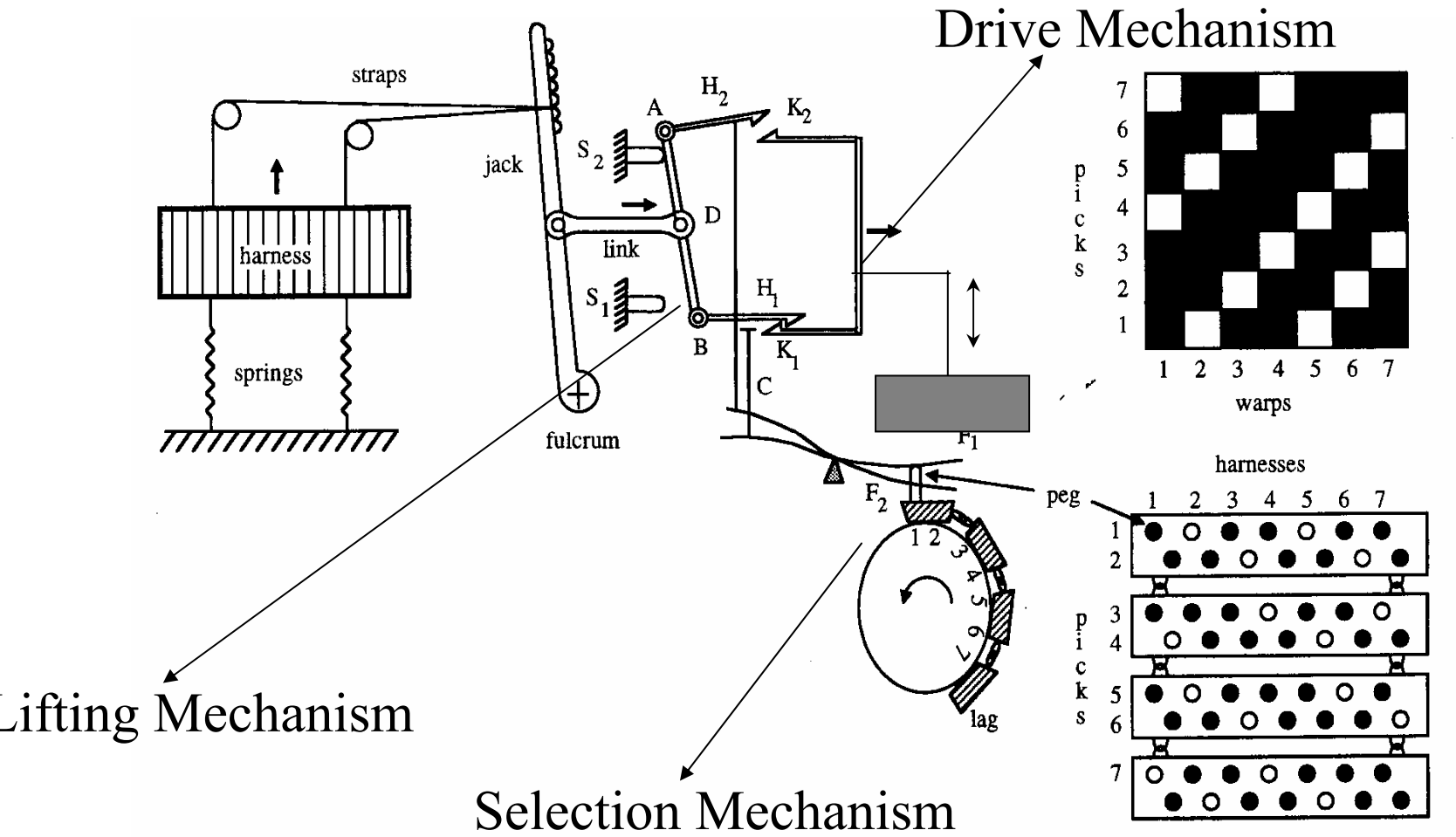
Dobby mechanisms

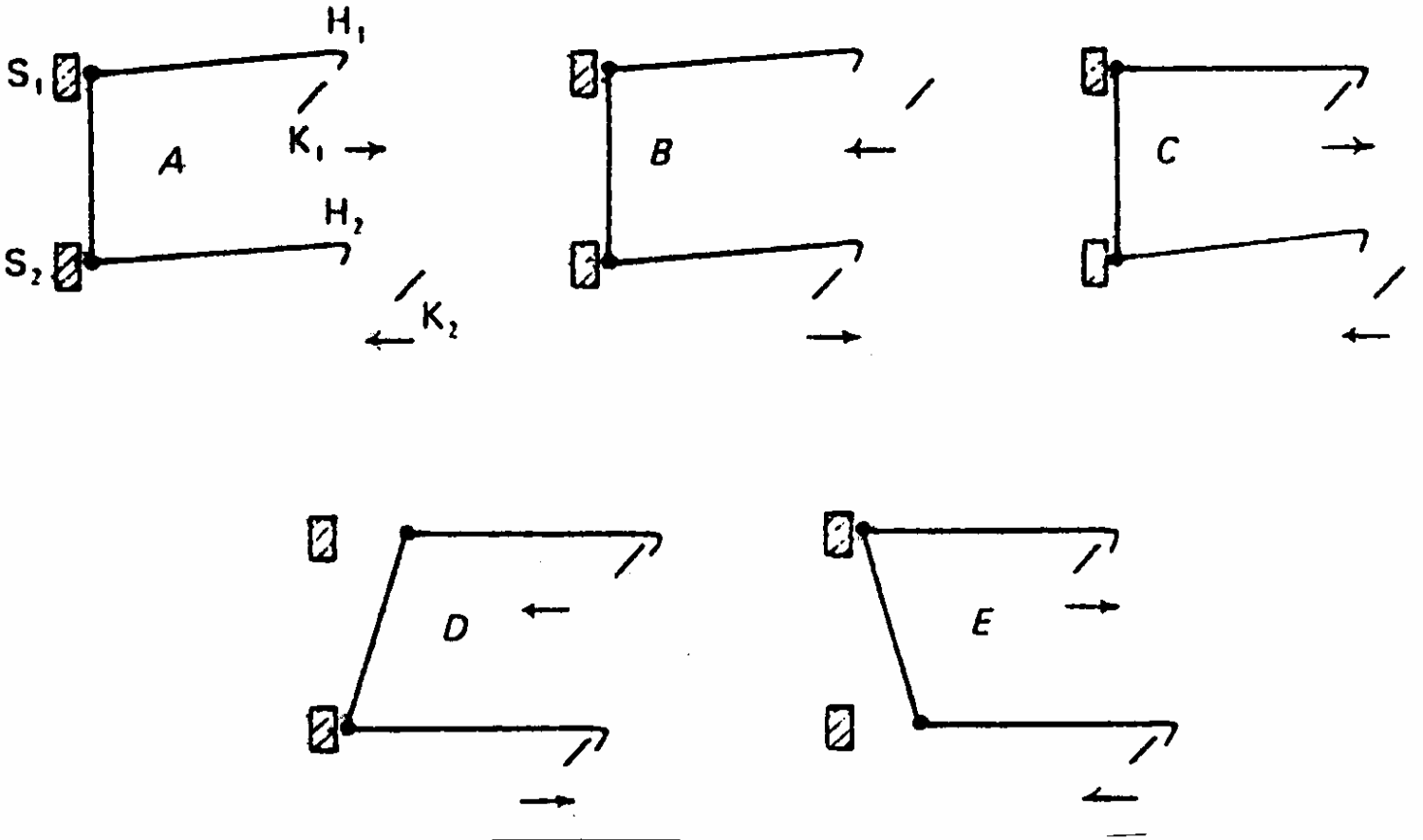
- **Double-lift dobbies:**
  - All new type dobbies are double-lift in their action.
  - Its cycle occupies two picks.
  - System elements operate once every two weaving cycles, but the shed opening is achieved every pick.
  - Most of the motions in dobby occur at half time loom speed.
  - Open shed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

Dobby mechanisms

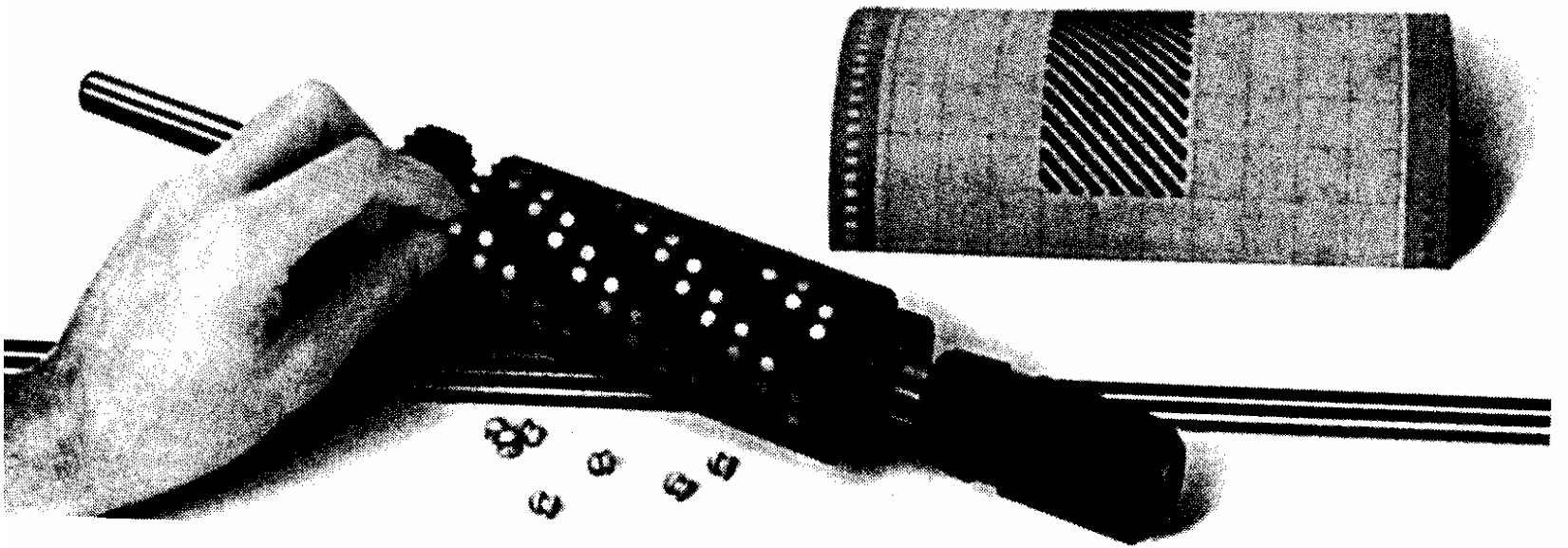
- The dobby consists of three principal mechanisms:
- The **drive mechanism**: An auxiliary shaft is permanently driven from the weaving machine.
  - It operates two steel bars (knives), having a regular reciprocating motion or
  - It operates coupling rings on a rotary dobby.
- The **selection mechanism:** It is operated by dobby card (or by some fotm of pattern chain)
  - It reads or checks the design information punched on a dobby 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 dobby)




S1
H1
A
K1
H2
S2
K2
B
C
D
E

Card Cylinder



Card cylinder for a modern dobby mechanism (courtesy of Staubli).

Card cutting and copying machines

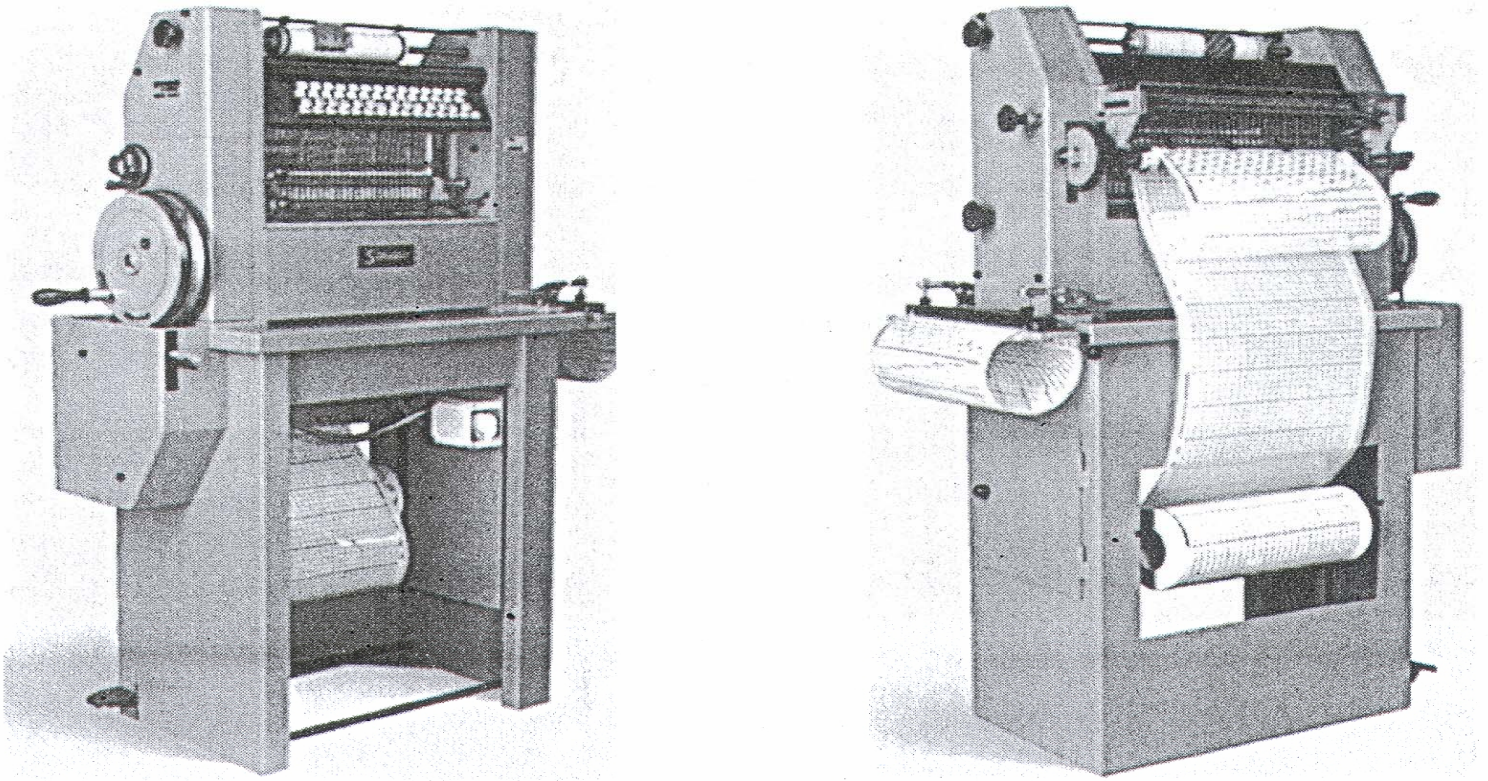


FIGURE 6.16 Motor driven card cutting and copying machine: left, front of the machine; right, back of the machine (courtesy of Staubli).

Card cutting and copying machines

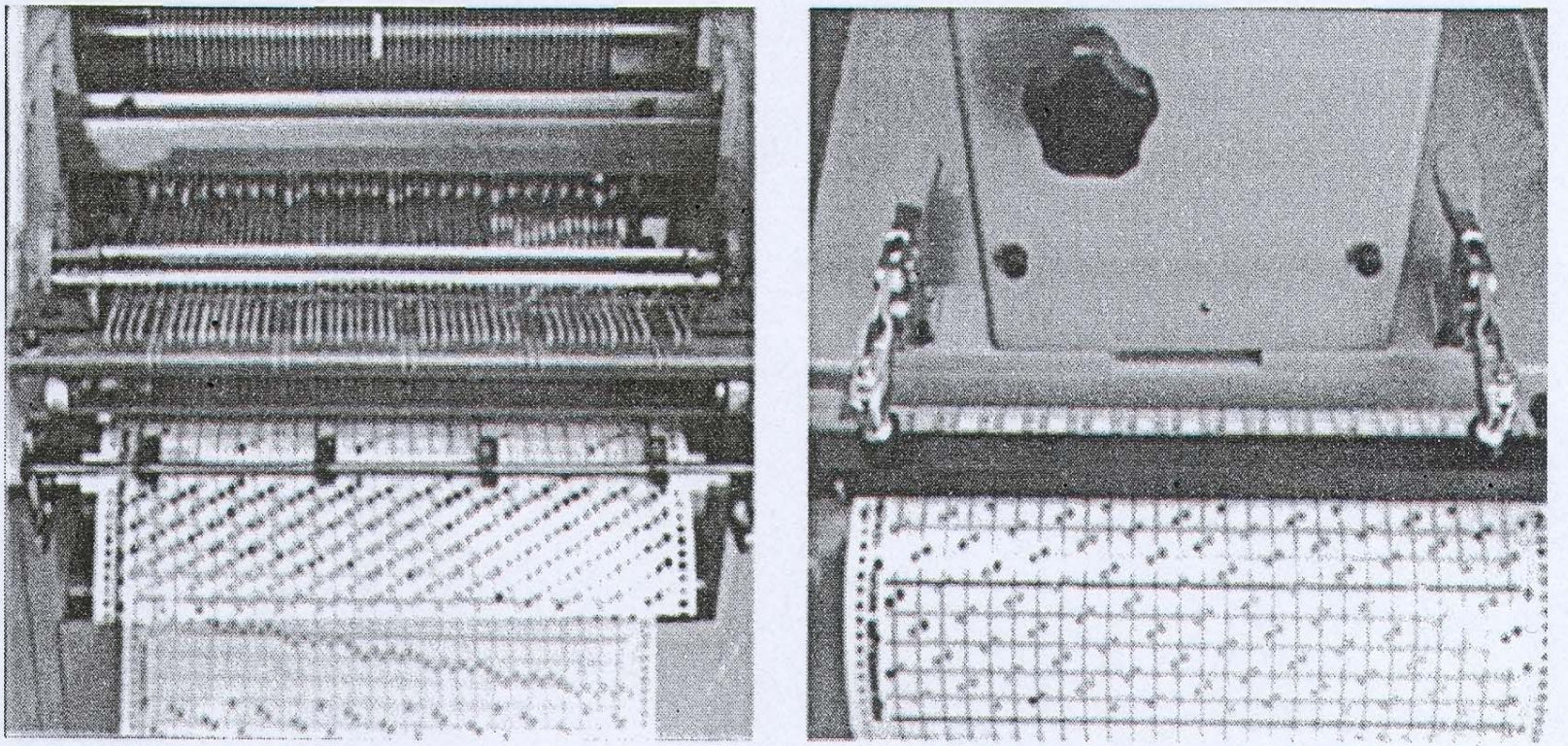
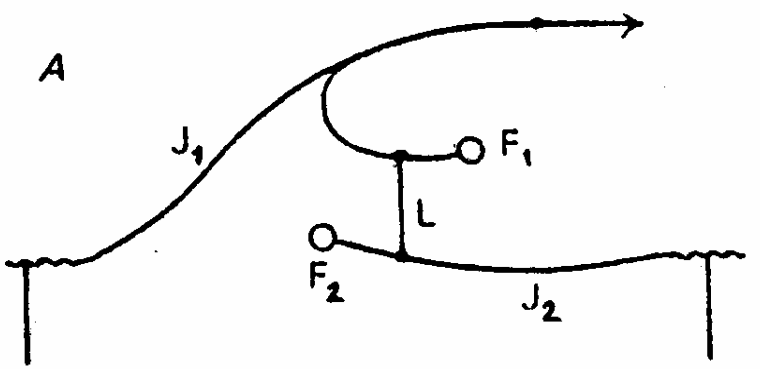
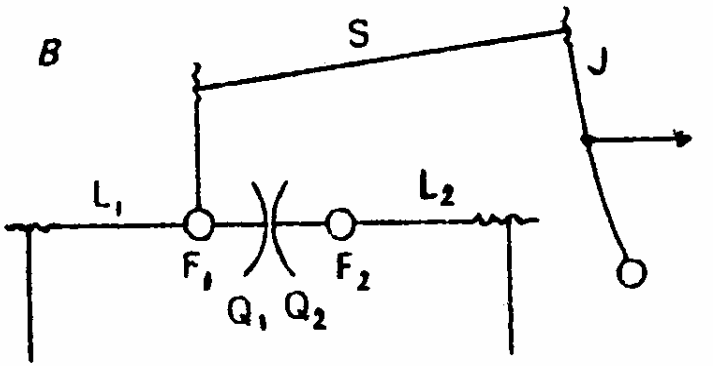
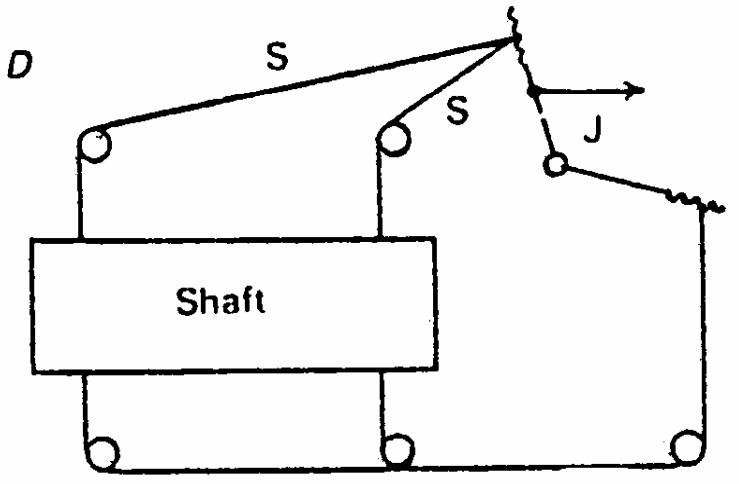


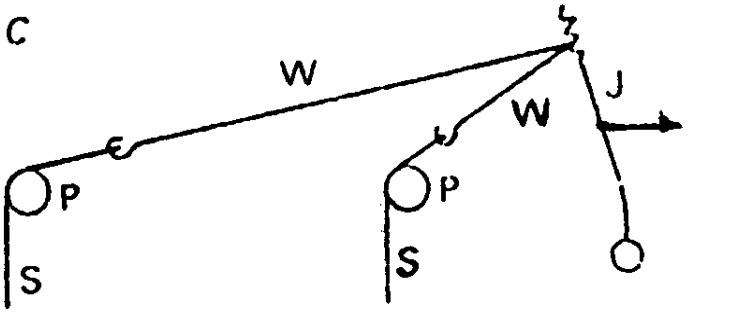
FIGURE 6.17 Copying (left) and pasting devices (courtesy of Staubli).

Heald shaft connections for negative dobbies









Placement of negative dobby

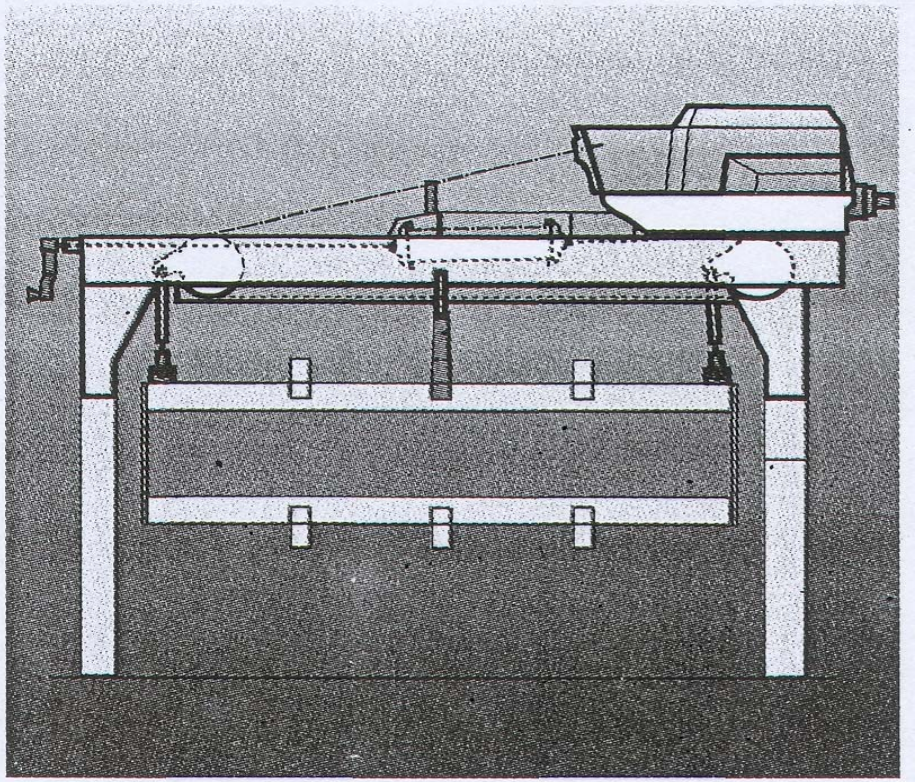
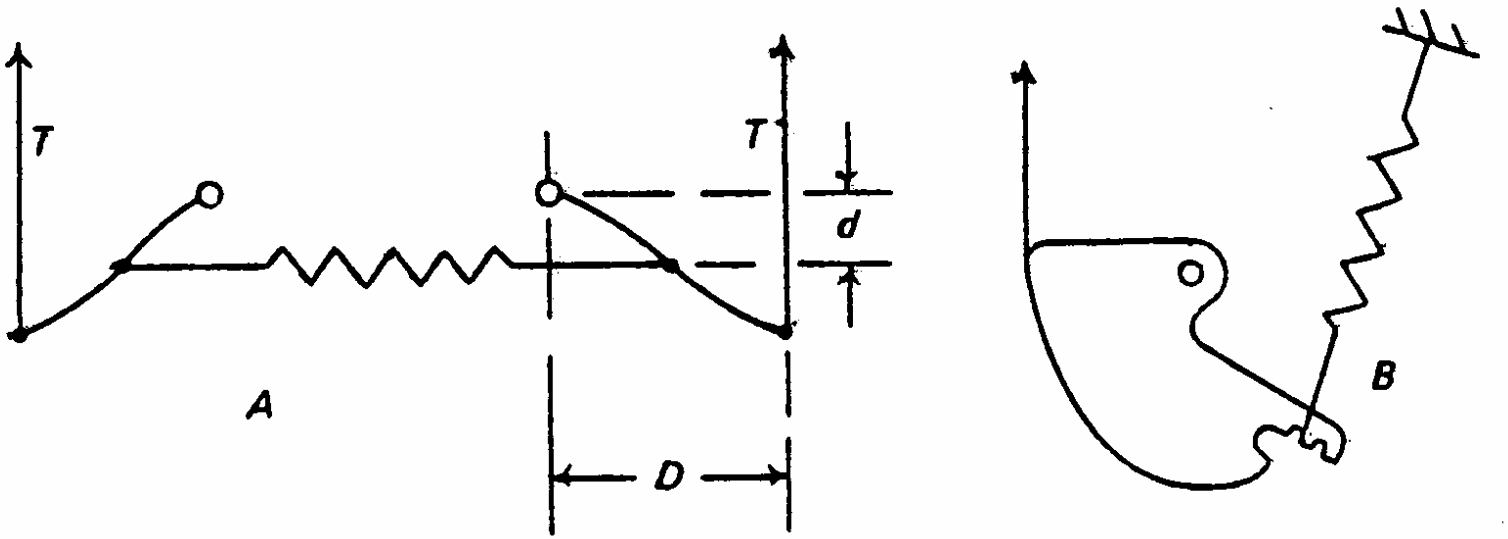


FIGURE 6.19 Placement of negative dobby (courtesy of Staubli).

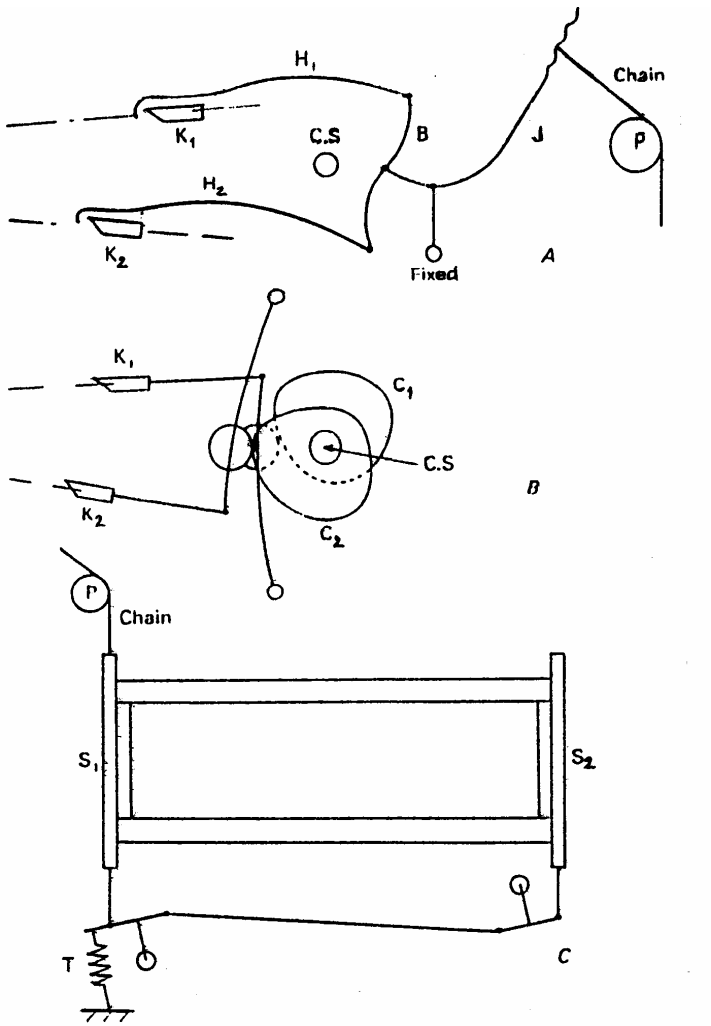
Heald shaft connections for negative dobbies

- 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

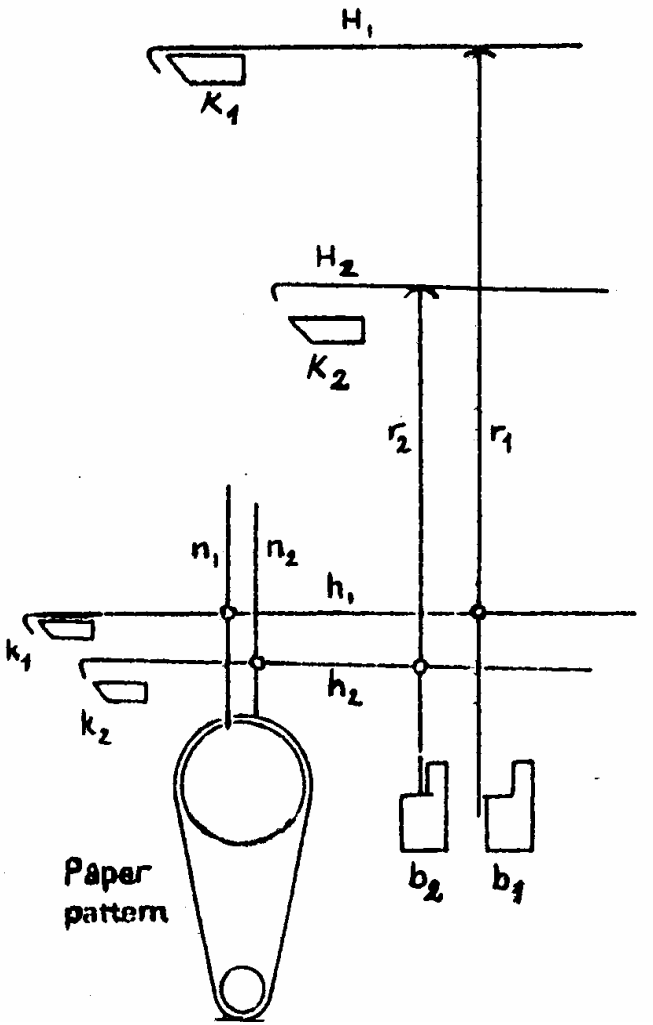


Ruti Dobby

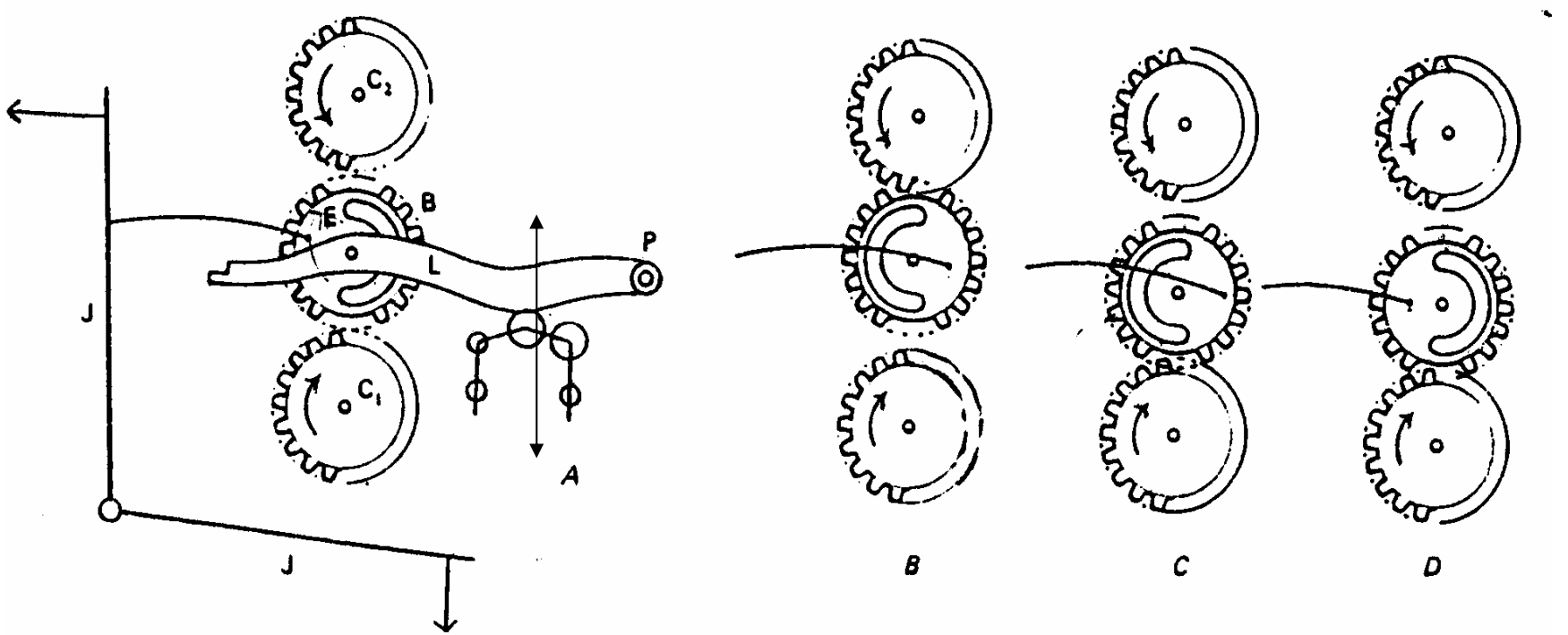


- Knives K_1 and K_2 are actuated by cams C_1 and C_2 mounted on the camshaft C.S.
- The cams are negative in action, and the cam followers are kept in contact with the cams by means of springs not shown in the diagram.
- The desired dwell can be obtained.
- The inclined knife track facilitates the hook engagement.
- Together with the inclined knife tracks this drive produces a more compact and efficient motion.
- This feature are commonly found on modern dobbies.

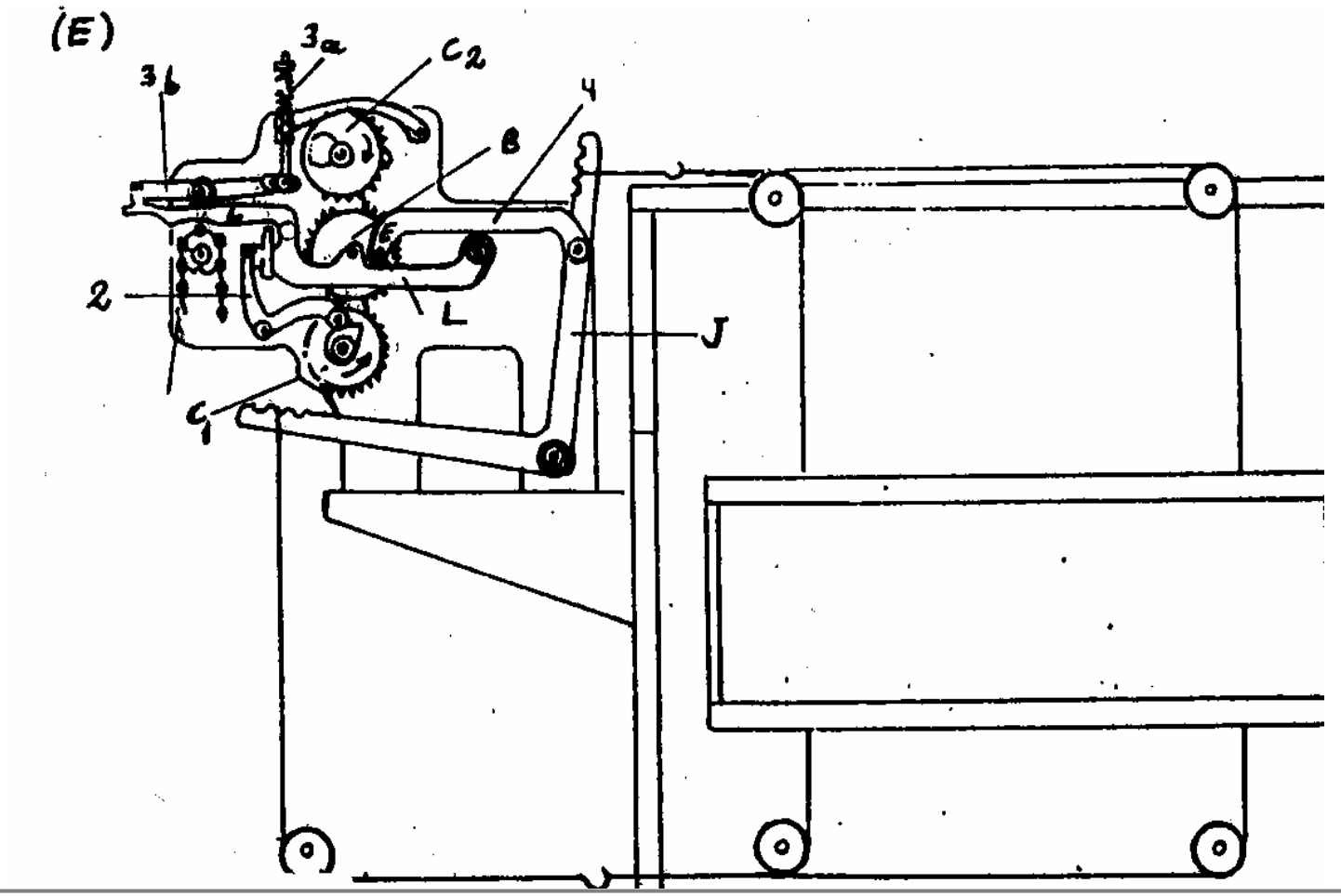
Selection Mechanism for Paper Pattern



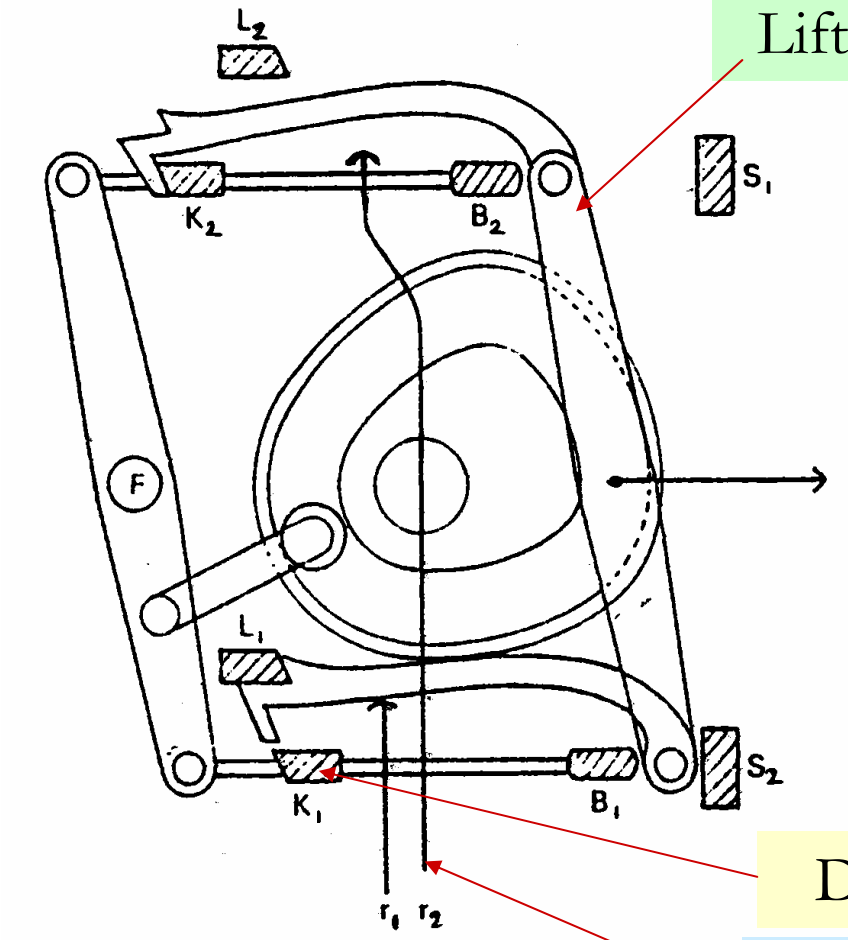
Knowles Positive Dobby



Knowles Positive Dobby



Positive dobby (Hattersley dobby)



Lifting

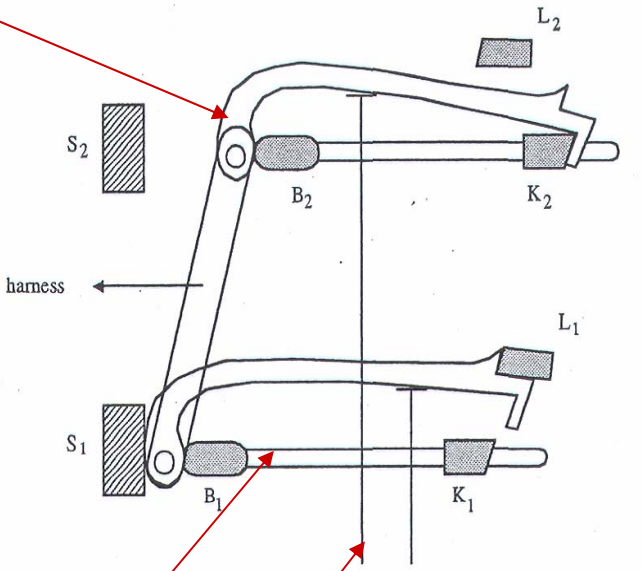
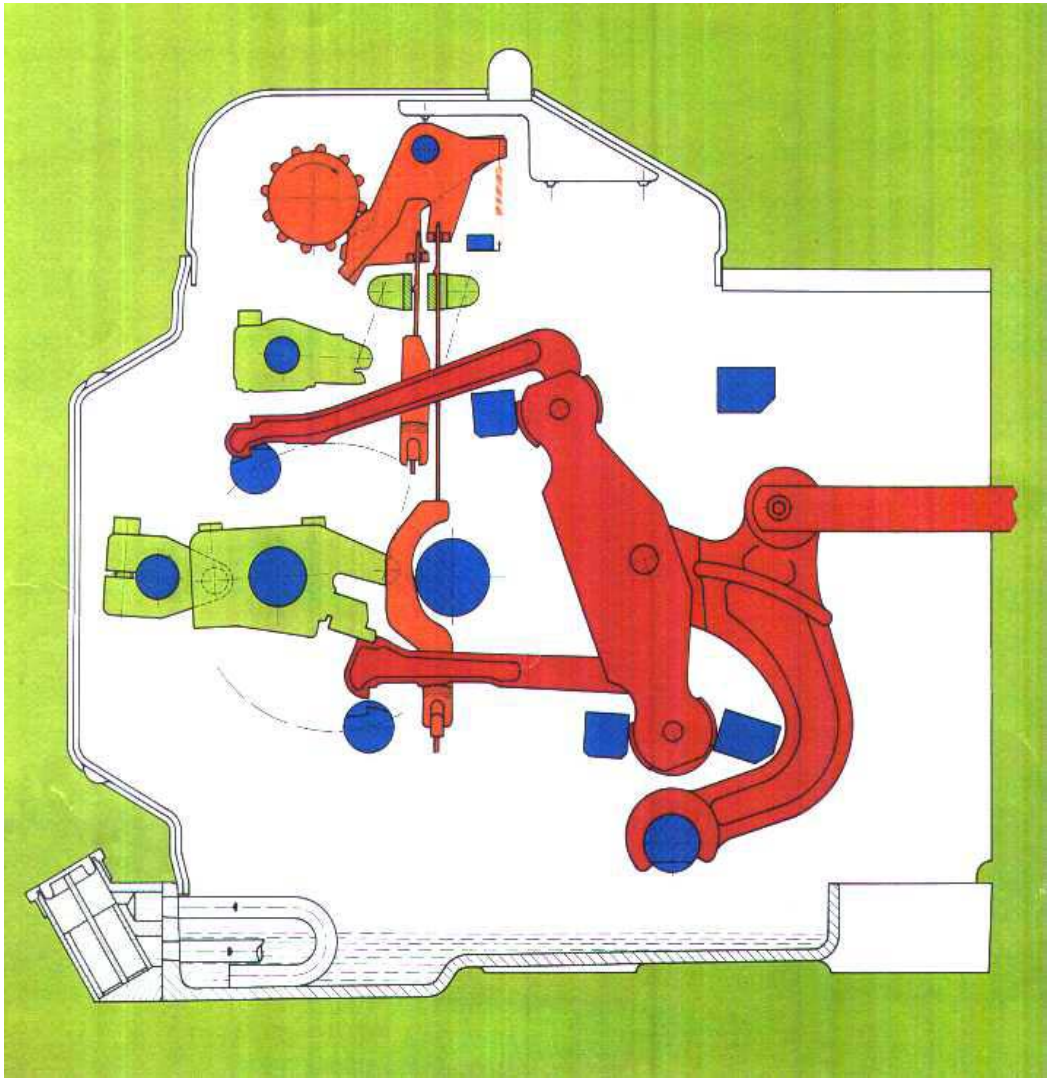


FIGURE 6.20 Schematic principle of positive dobby [2].

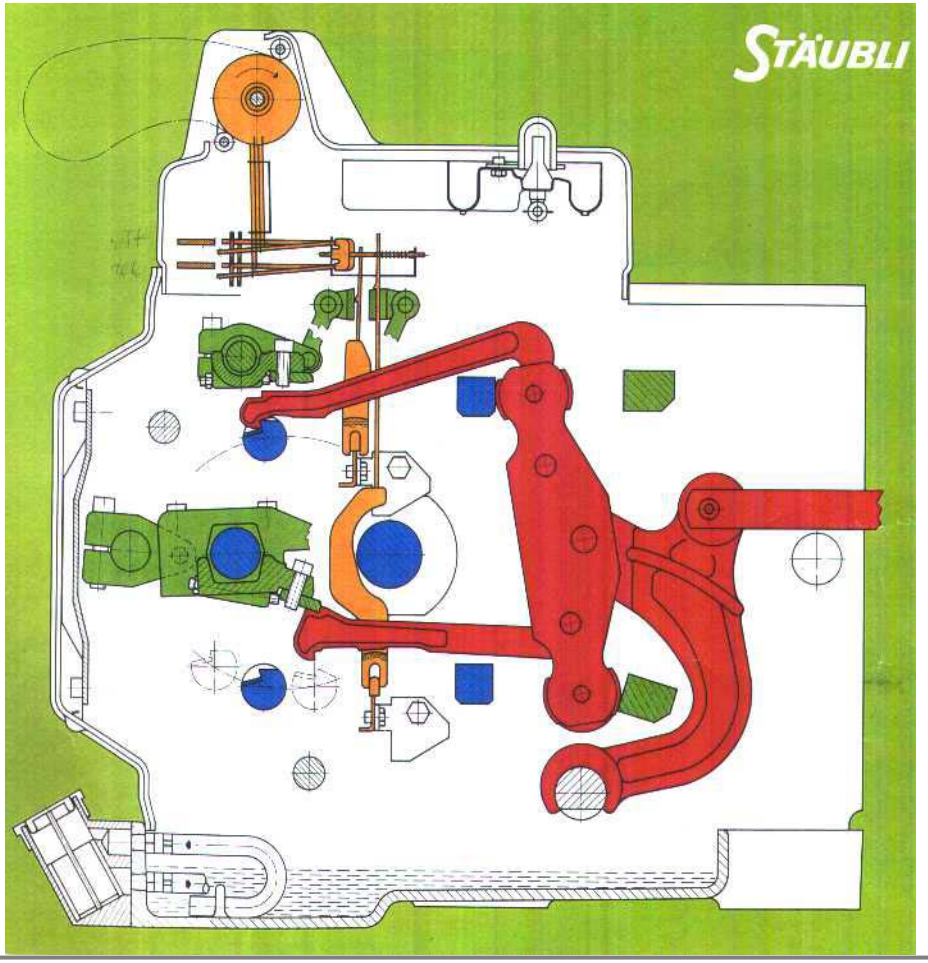
Drive

Selection

Staubli - 2212



Staubli - 2232



Staubli dobby-Type 300

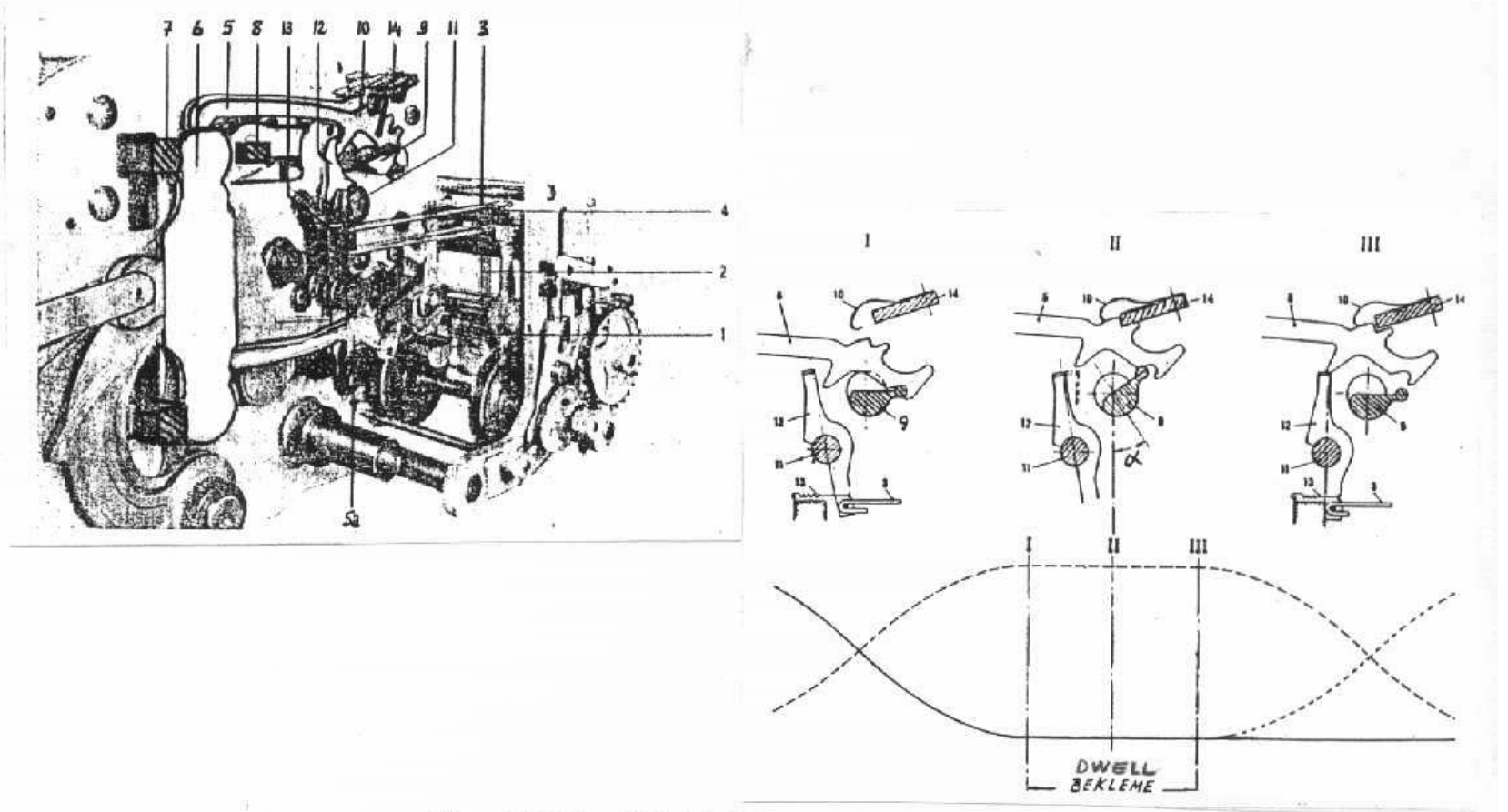


Fig. 4.32 The Stäubli Dobby, Type 300

Hattersley dobby

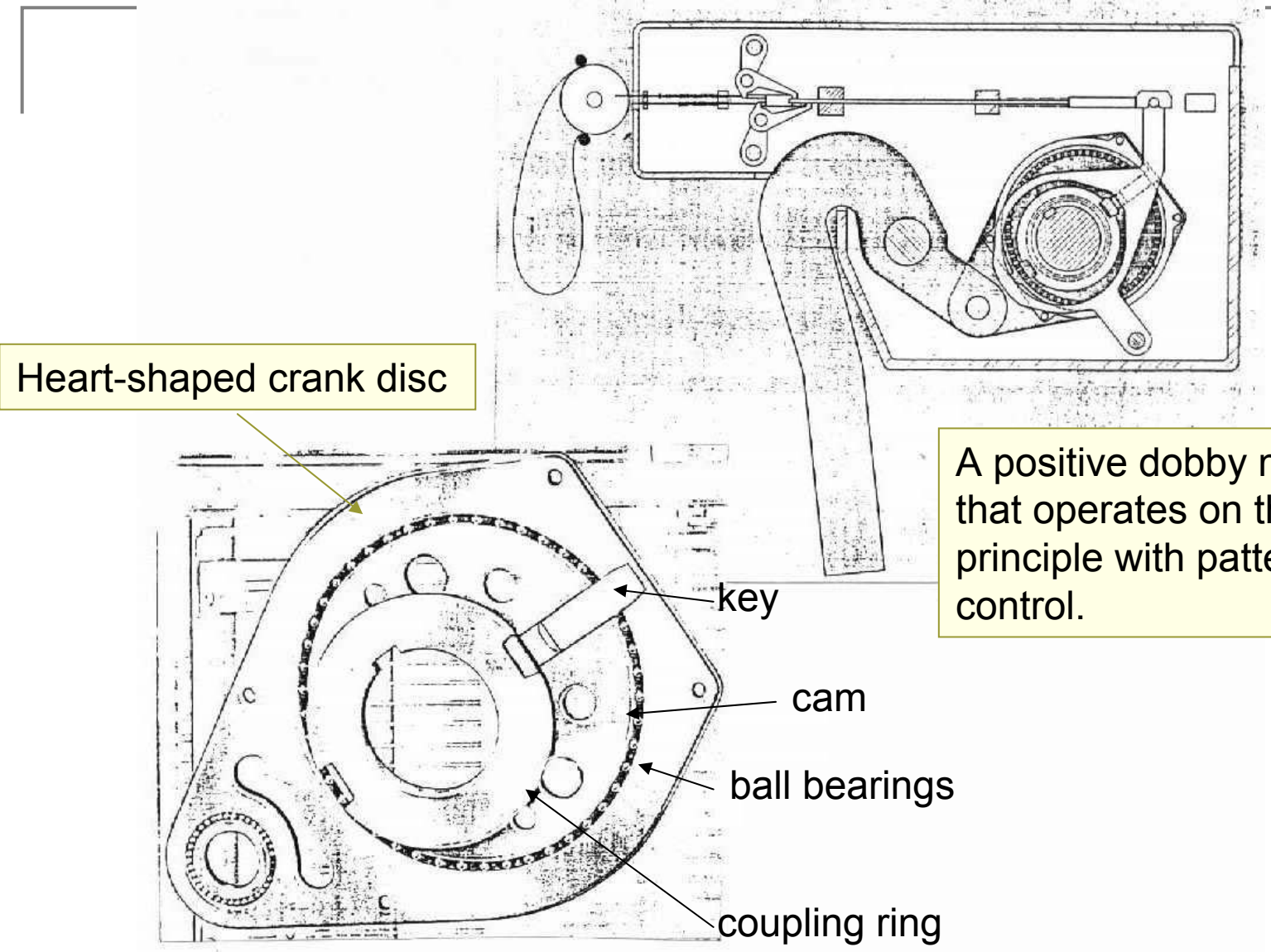
- Presently, only double-lift dobbies are manufactured.
- In the Hattersley system long hooks of grey cast iron were adjusted in horizontal position; they engage the knife by the effect of dead weight.
- The highest speed attained on the shuttleless weaving machine is 500 rpm, which is equipped with a modified version of Hattersley dobby where the hook mass have been considerably reduced.
- The biggest obstacle on the way to further speed increase is the hook mass.

Rotary dobbies

- In order to achieve dobby shedding at faster speeds, **new generation rotary dobbies** 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 dobby.
- 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.

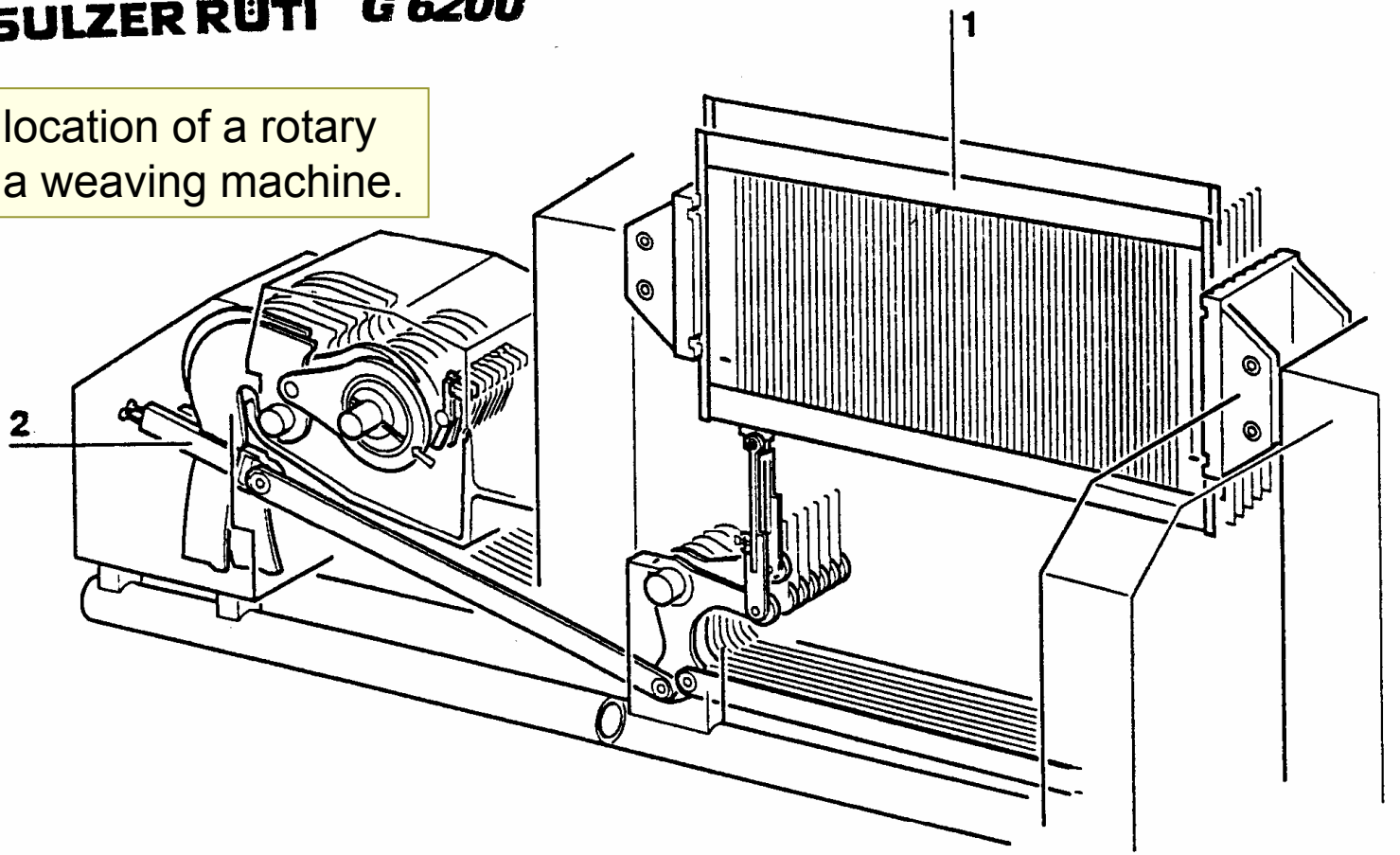


A positive dobby machine that operates on the rotary principle with pattern card control.

Fig. 4.34 High performance rotary dobby of the Series 2400

SULZER RÜTI G 6200

Mounting location of a rotary dobby on a weaving machine.



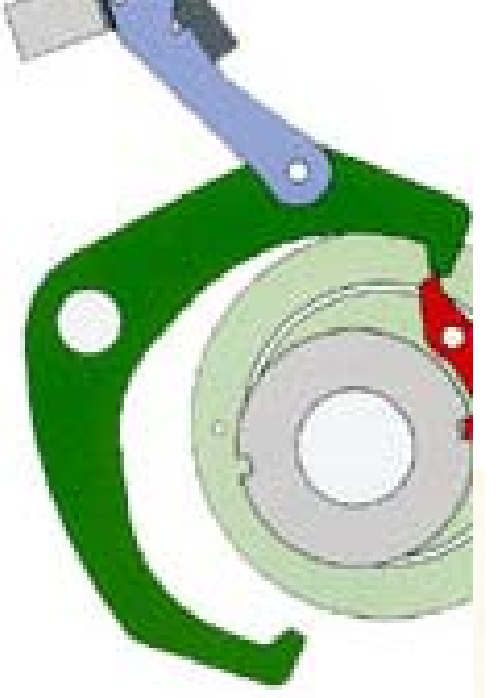
1 Shafts
2 Jack runners

Electronically controlled "Stäubli" rotary dobby

This dobby 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 dobby

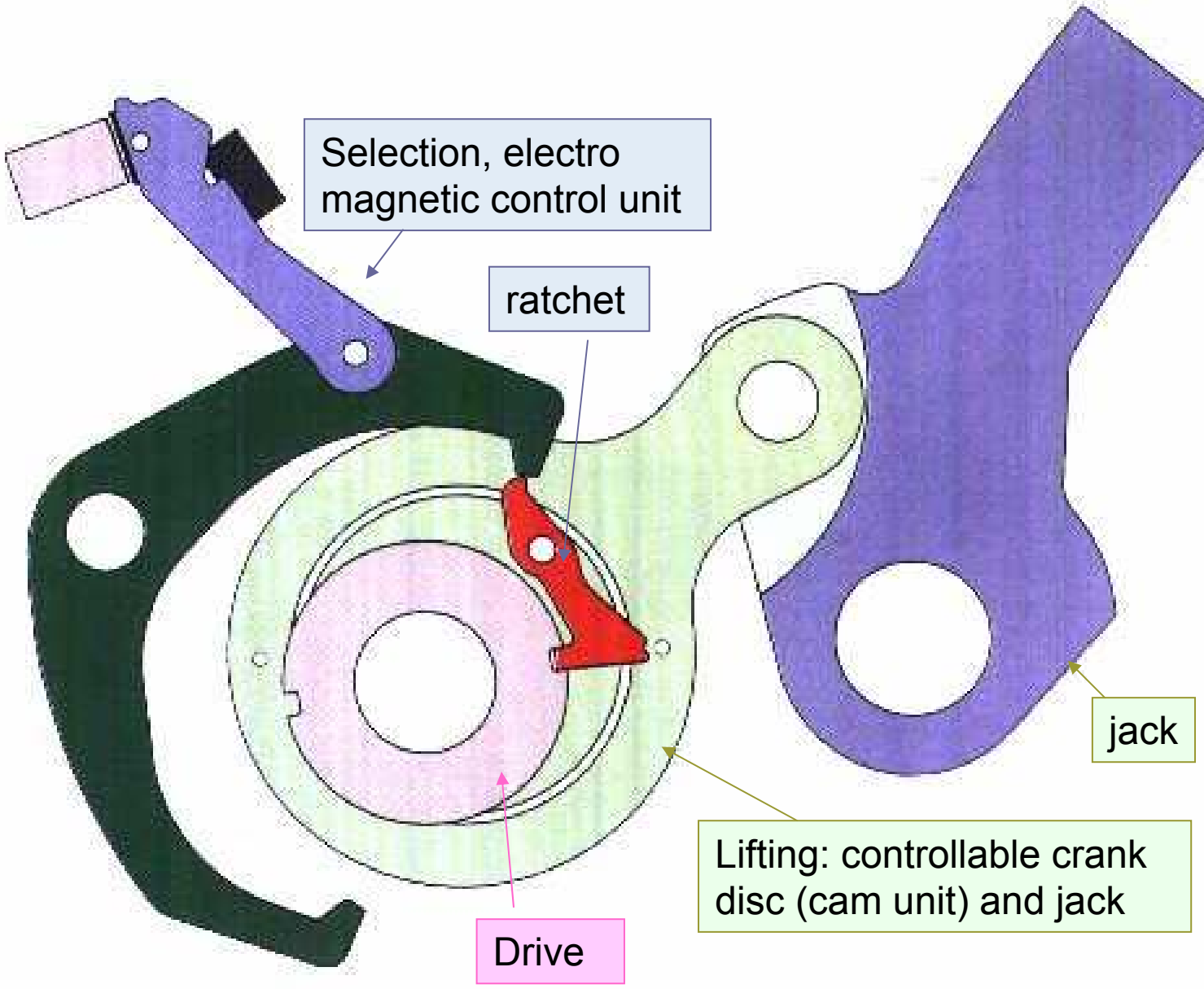
- **Drive mechanism (Modulator):**
  - Modulator, complementary cams, coupling ring
- The modulator transforms the regular rotary motion of the weaving machine into an **irregular rotary motion**.
- By the use of complementary cams precise laws of motion results, meeting the requirements of any type of weaving machine.
- Irregular rotary motion means that the cam shaft turns through 180^0 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 dobby

- **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 pattem by the control unit which may be mechanical or electronic.
- A 180° 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 180^0 rotation of the cam causes a lifting motion.


Selection, electro magnetic control unit
ratchet
jack
Lifting: controllable crank disc (cam unit) and jack
Drive

Rotary Dobby

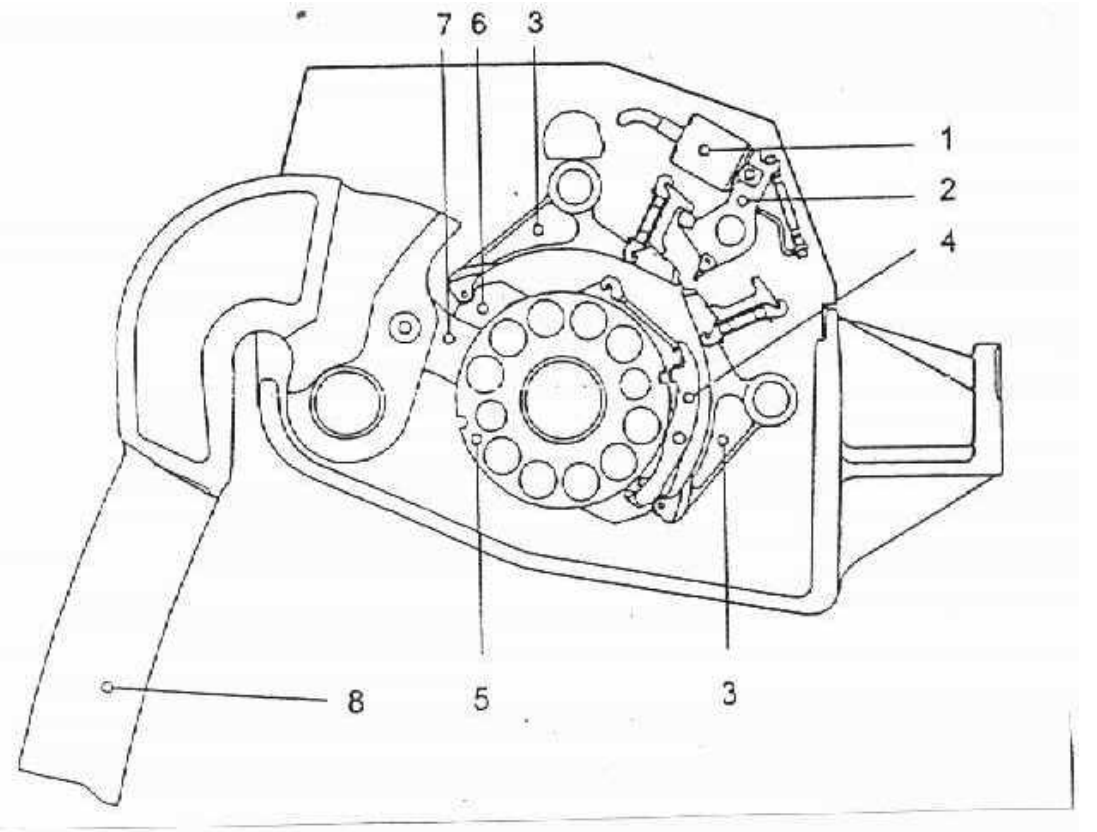
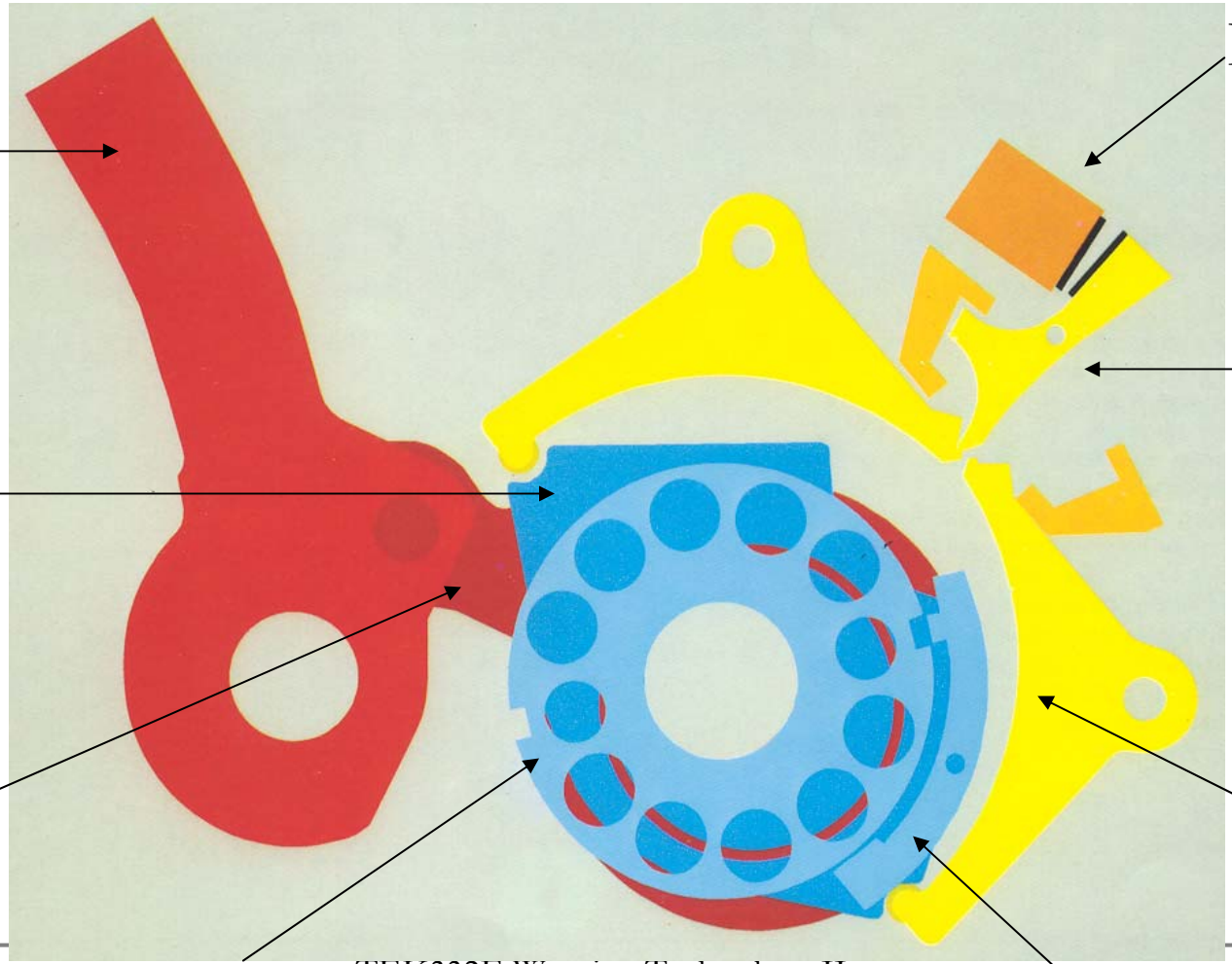
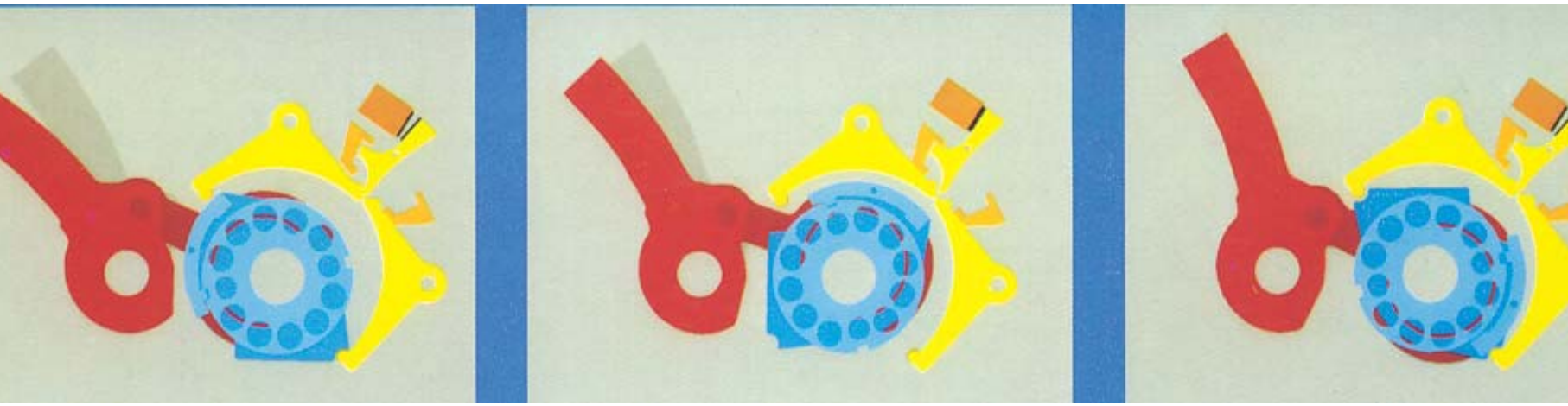


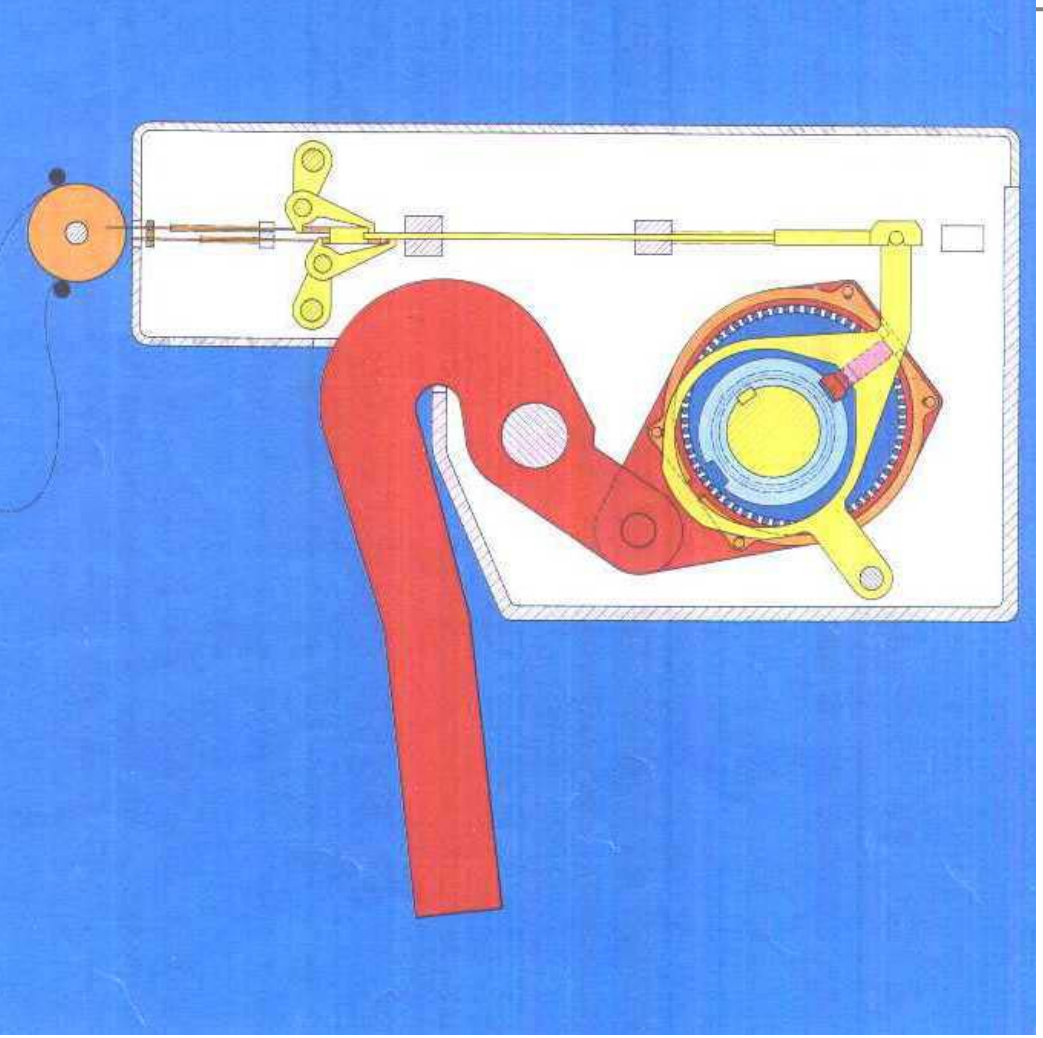
Fig 4.35 High performance rotary dobby of the Series 2600

Rotary Dobby



Rotary Dobby





Functional principle

Each harness frame is controlled by a ca unit, a compact element only 12 mm wid which converts the irregular rotation of th main shaft directly into the linear motio required for the harness drive. The ca unit consists of a heart-shaped crank di which encloses the cam mounted on coupling ring, plus the key - the on controlled part. The key connects the ca with the coupling ring fixed on the ma shaft and makes the cam at the end of th crank disc, which rotates in cycles of 180 perform a lifting motion. The indexing ar controls the key according to the patter The reading device is a self-contained un of very simple conception. The pulle move forwards and backwards an transmit the information read by the feel needles via traction elements and indexin arms to the keys.

he reading device of the rotary dobby operates true to the picking sequence, regardless of the positio om which the direction of rotation is reversed.

ith this ingenious combination of feeler needle, traction element, indexing arm, key and cam unit - a ndamental invention patented by Staubli - a control system with unsuperpassed safety factor has een created, unique in its simplicity and efficacy.

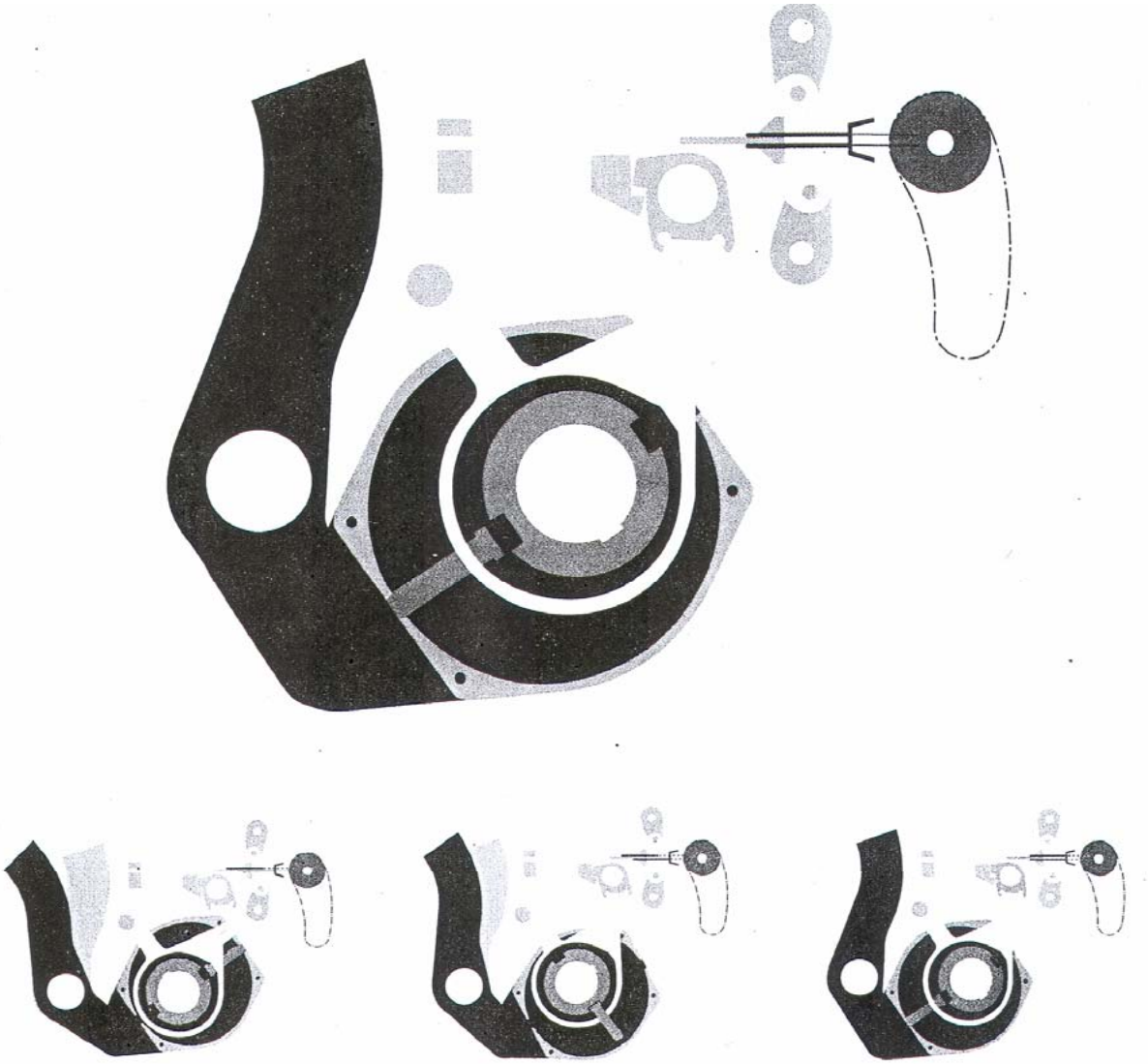


FIGURE 6.29 Functional principle of positive rotary dobby with pattern card control (courtesy of Staubli).

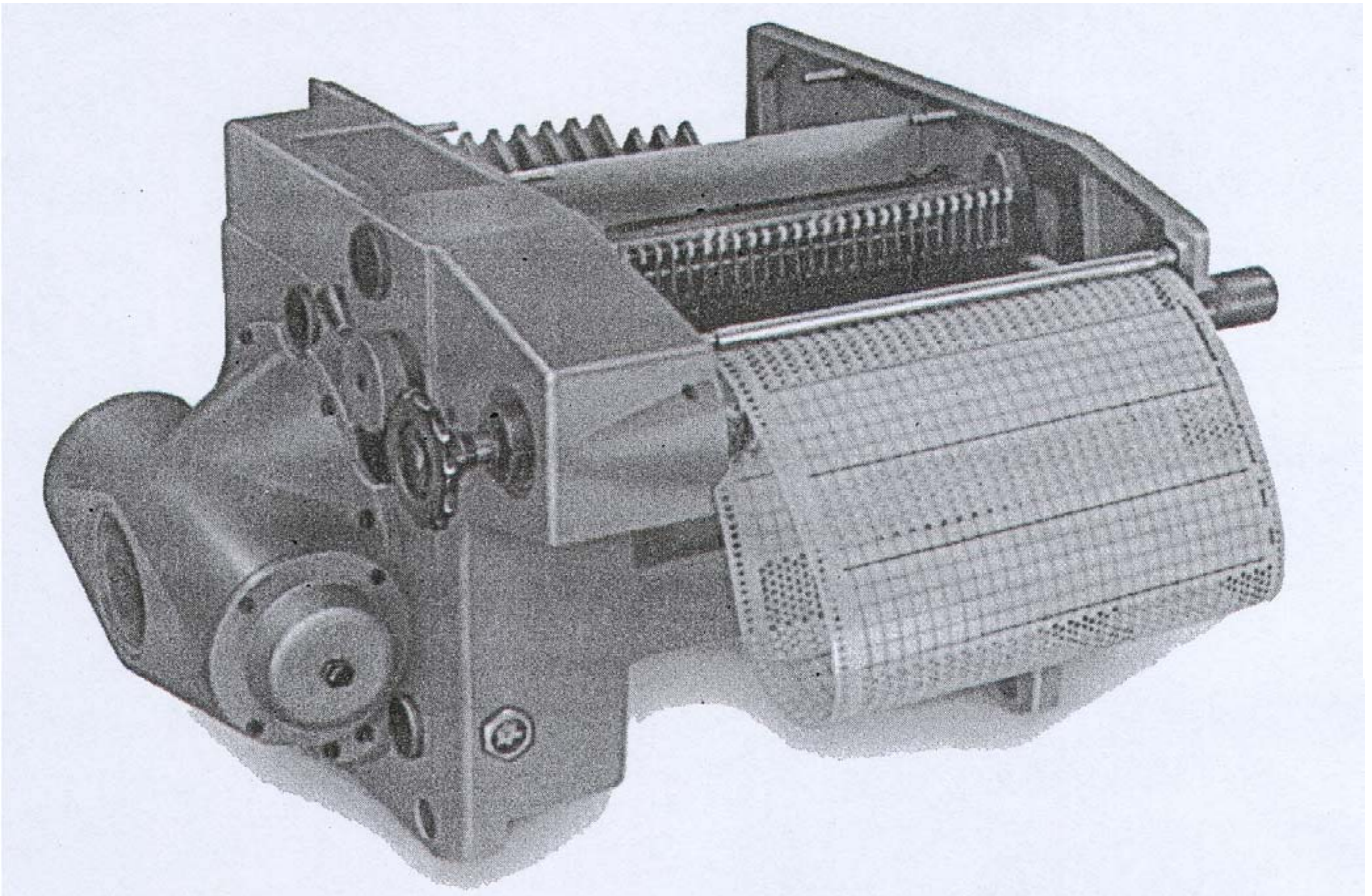
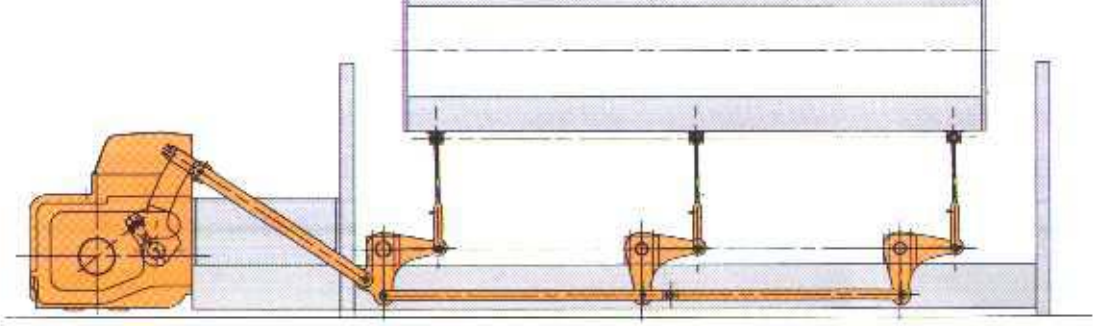
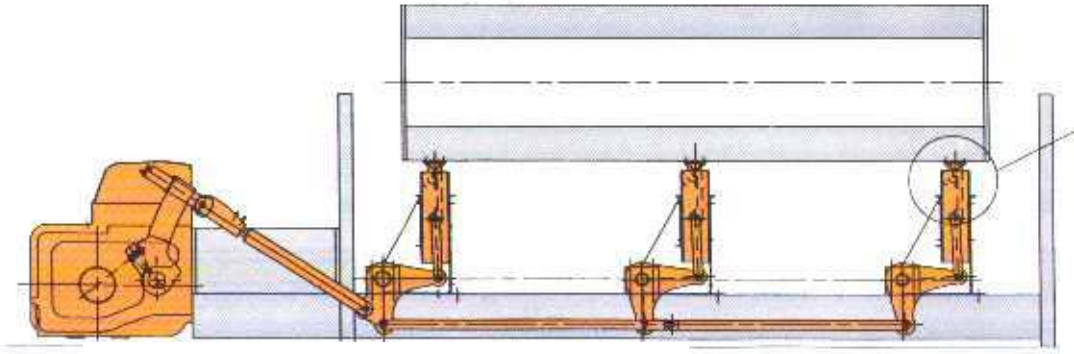
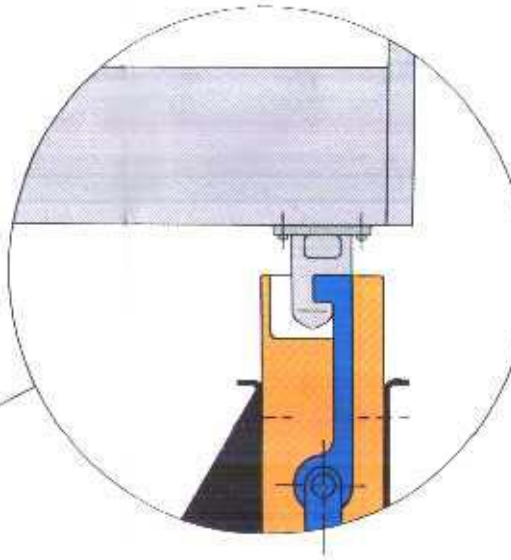


FIGURE 6.28 Positive rotary dobby with pattern card control (courtesy of Staubli).







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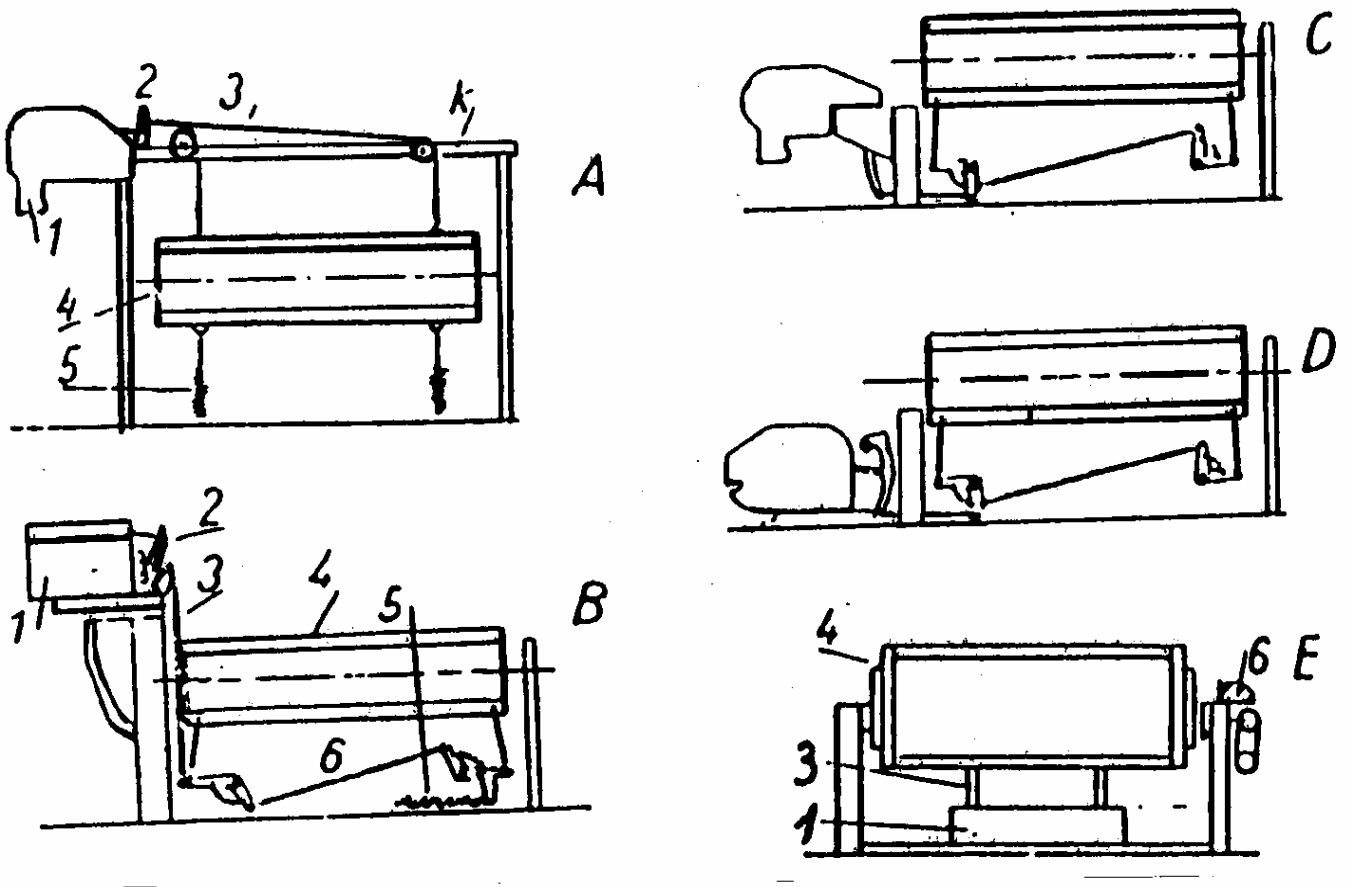
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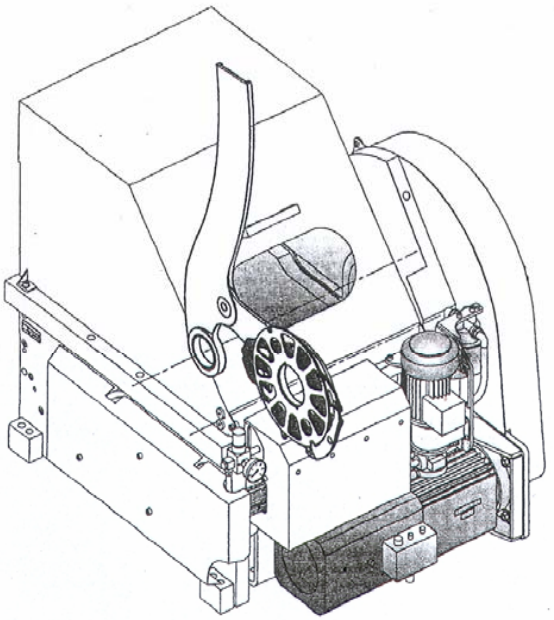


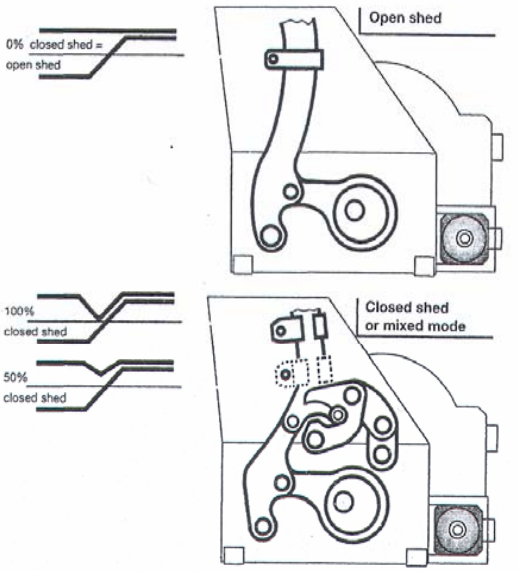
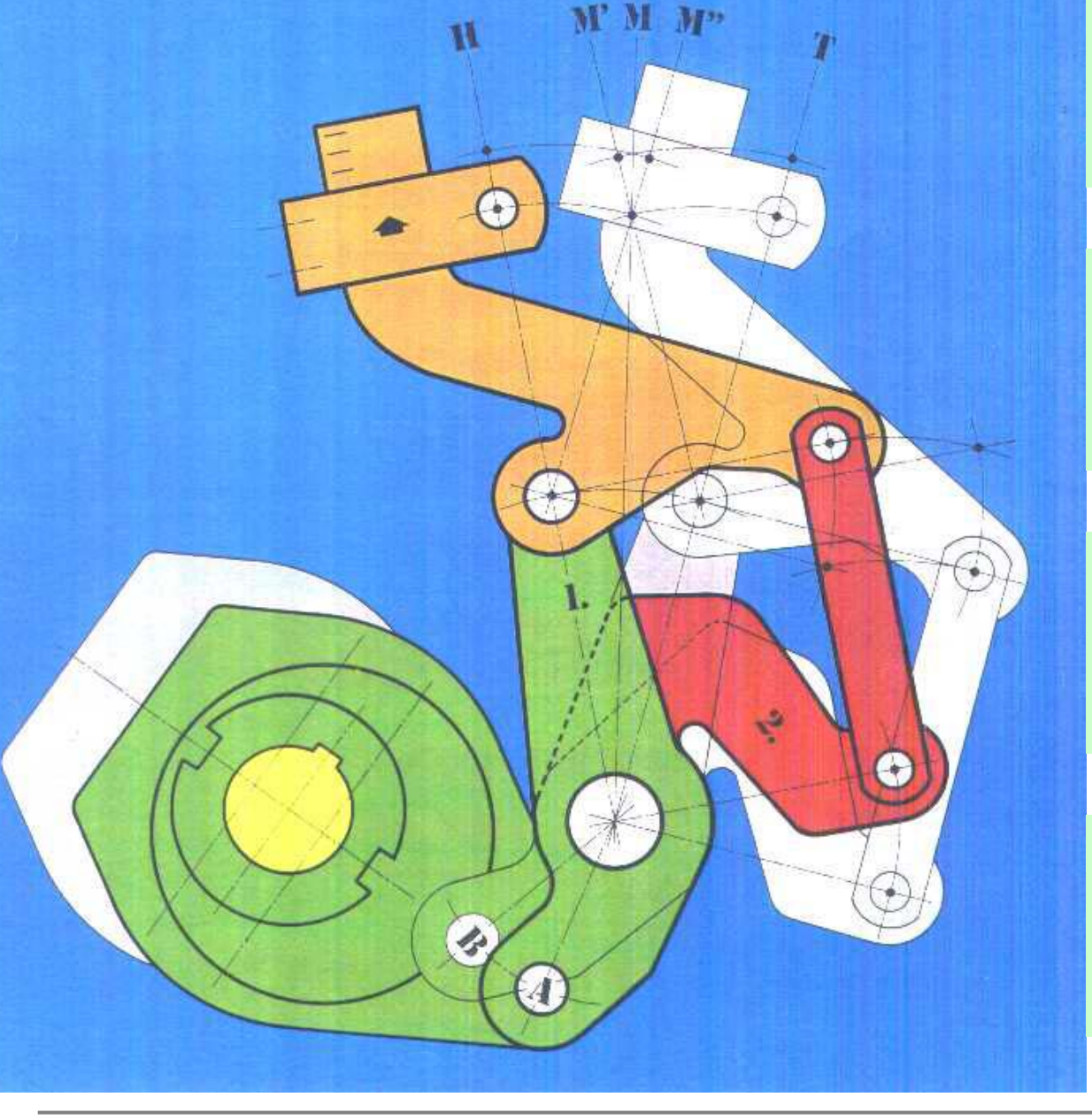


FIGURE 6.31 Schematic of shed motions (courtesy of Staubli).



1.Jack in position A

2.Jack in position A

= pile harness fram
in upper shed H

1.Jack in position B

2.Jack in position B

= pile harness fram
in lower shed T

1.Jack in position A

2.Jack in position B

= pile harness fram
in middle shed M

1.Jack in position B

2.Jack in position A

= pile harness fram
in middle shed M

M' = middle shed position

M" = middle shed position