Chapter 5:
Beat-up Mechanisms

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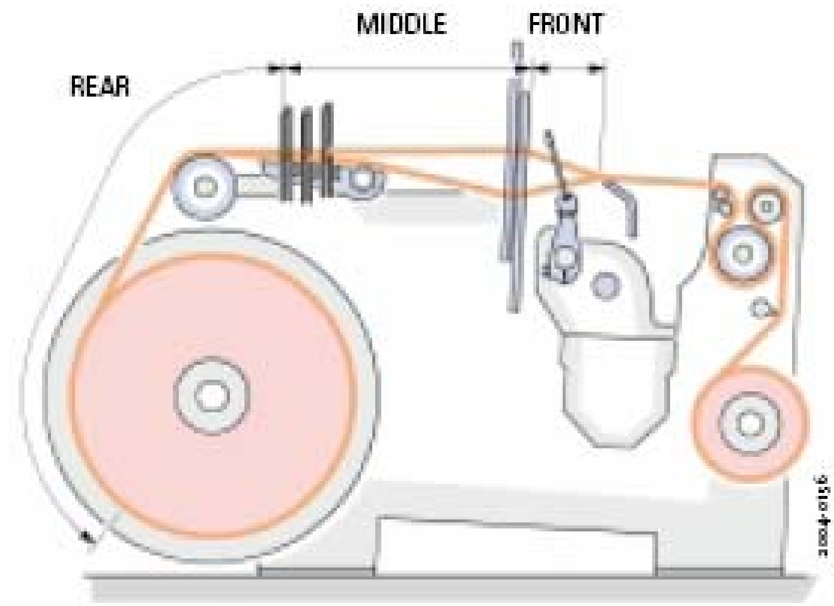
Beat-up Motion

- The third primary weaving motion is performed by the beat-up mechanism (sley mechanism).
- **The main function of the beat-up mechanism is the reciprocating motion of the reed.**
- During weaving the reed performs the following functions:

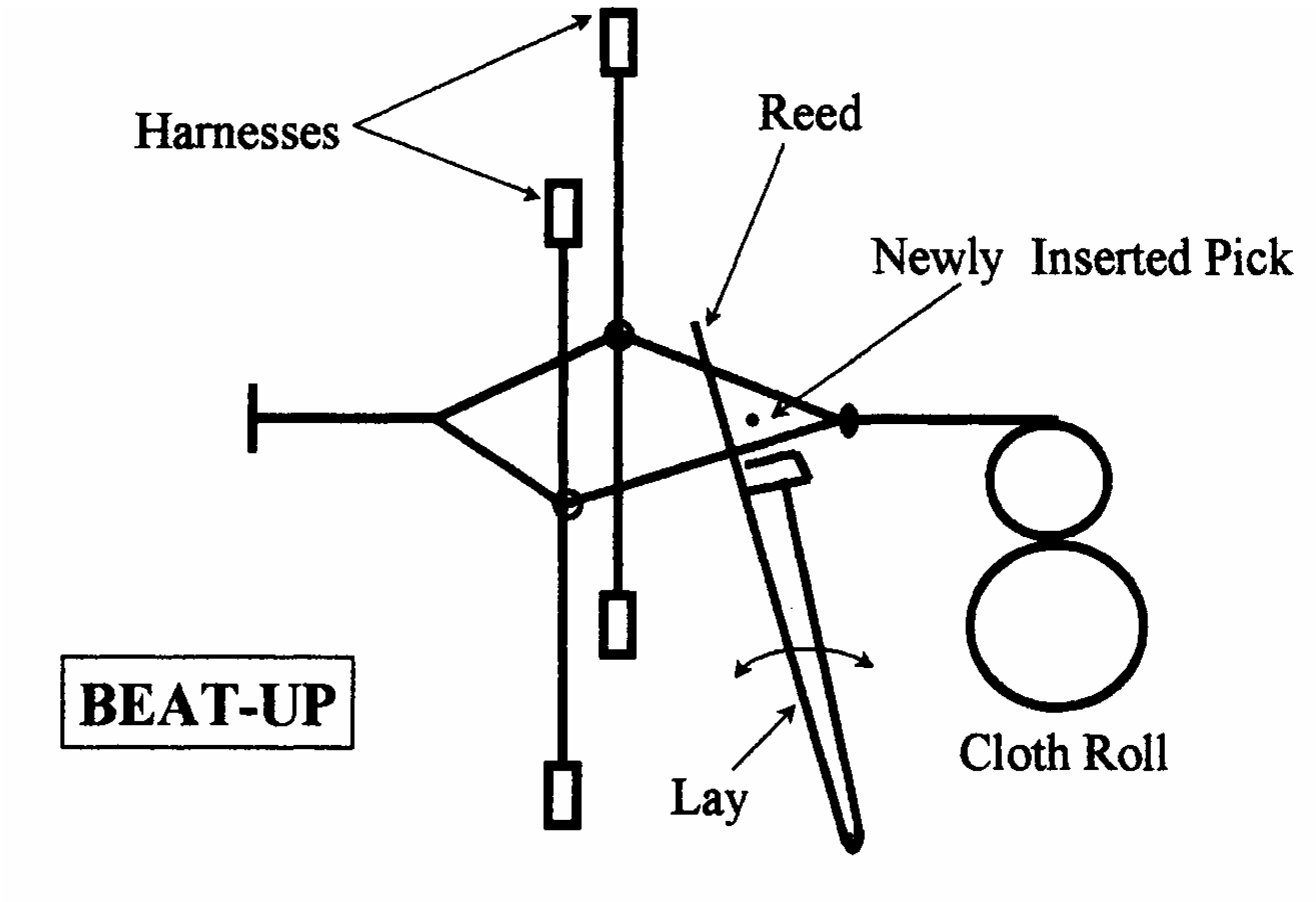
1. **It holds the warp ends at given distances thus determines the warp density and fabric width precisely.**
2. **Together with the race board and other guiding elements, it guides the weft carrier across the warp sheet.**
3. **The principal and most important function of the reed is to beat-up every inserted weft thread to the fabric fell.**

Beat-up Motion

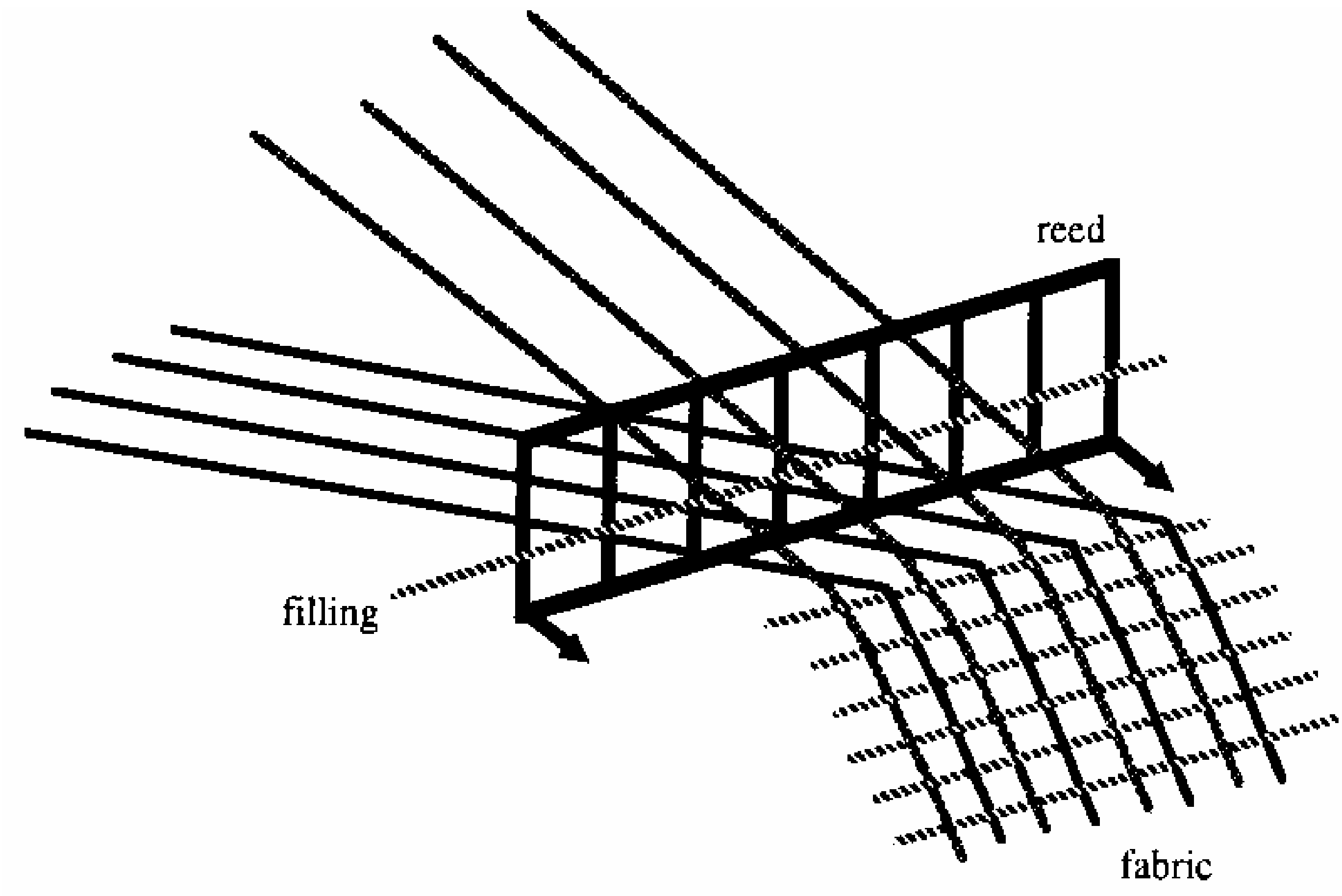
- The motion of the sley approximates to simple harmonic.
- It should dwell as long as possible at the rear dead center to leave the largest possible section of the angle for the weft insertion.
- On the other hand, it should beat-up the weft to the fabric fell strongly in order to obtain the desired pick density.



Rearmost position of the reed during weft insertion



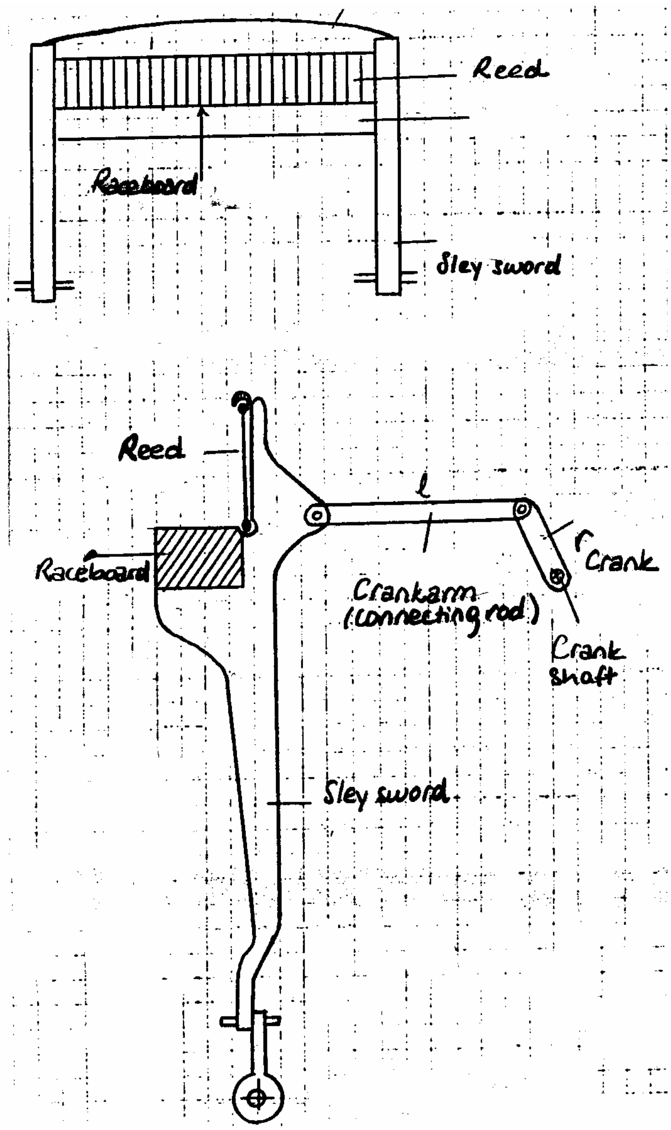
Beat up position of the reed



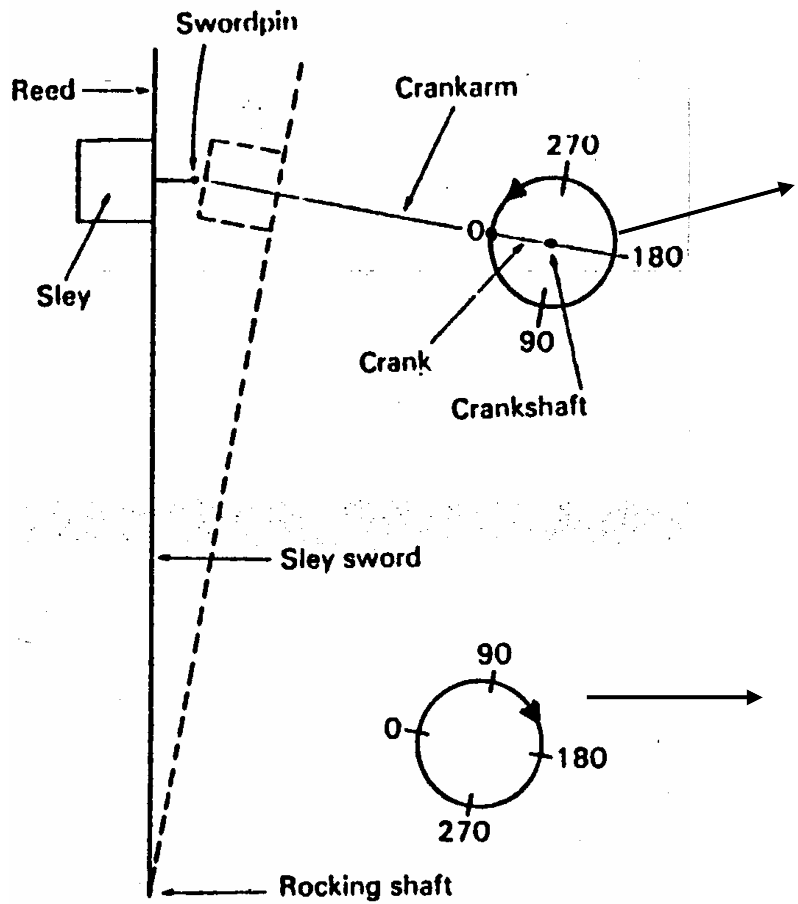
Loom timing

- The timings of most of the events in the loom cycle are governed by the position of the reed and thus the sley.
- For example, the reed must be on its way towards the back of the loom before the shed is large enough to admit the shuttle. This determines the timing of the picking mechanism which is directly related to the position of the reed and sley.
- Some others are related to it indirectly. For example. the timing of the weft break stop motion is related to the flight of the weft carrier, which is governed by the position of the reed.
- The timings on the weaving machine are stated in relation to the angular position of the crankshaft (main shaft) which operates the sley.

Four-link sley



Loom timing



Crank cycle
0 = front
90 = bottom
180 = back
270 = top

Opp. Crank cycle
0 = front
90 = top
180 = back
270 = bottom

Loom timing

- The path traced out by the axis of the crank pin is called the ‘crank circle’.
- The arrow on the crank circle shows the usual direction of rotation of the crankshaft.
- When the crank and crank arm are in line, and the sley is in its most forward position.
- The crank circle is graduated in degrees from this point in the direction of rotation of the crankshaft.
- Any timing can be stated in degrees, as, for example, ‘healds level at 300^0’.

Loom timing

- Looms are provided with a graduated disc on the crankshaft and a fixed pointer to make settings in relation to the angular position of the crankshaft.
- With the reed in its most forward position, the disc is adjusted so that the pointer is opposite to 0^0 on the graduated scale.
- The loom may then be turned to any desired position manually, the disc turning with it and the pointer remaining vertical and indicating the angular position of the crank shaft.
- In modern looms with microprocessors, the main shaft position is displayed on a screen, but the setting principle remains same.

Types of beat-up mechanisms

- There are several types of mechanisms used for achieving the required motion of sley.
- They are mainly divided into two:
  - **link-type beat-up mechanisms**
    - Four-link
    - Six-link
    - Multi-link
  - **cam operated beat-up mechanism.**
  - special mechanisms

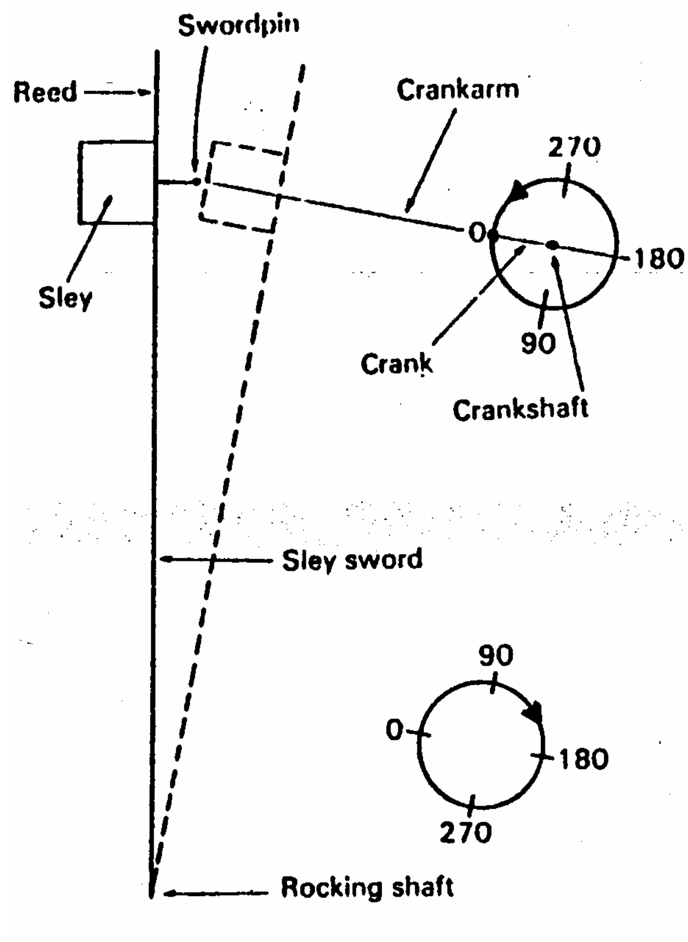
The motion of the sley

- Factors Affecting the Motion
- When the sley is operated by crank and crankarm, and its motion approximates to simple harmonic.
- The extent to which it deviates from simple harmonic motion has practical significance and is governed by the following factors:

  a. the radius of the arc along which the axis of the swordpin reciprocates,
  b. the relative heights of the swordpin and crankshaft, and
  c. the length of the crank in relation to that of the crankarm

Factors Affecting the Motion

The normal arrangement: The axis of the crankshaft is on a line passing through the extreme positions of the axis of the swordpin, and the reed is vertical at beat up.



Factors affecting the sley motion

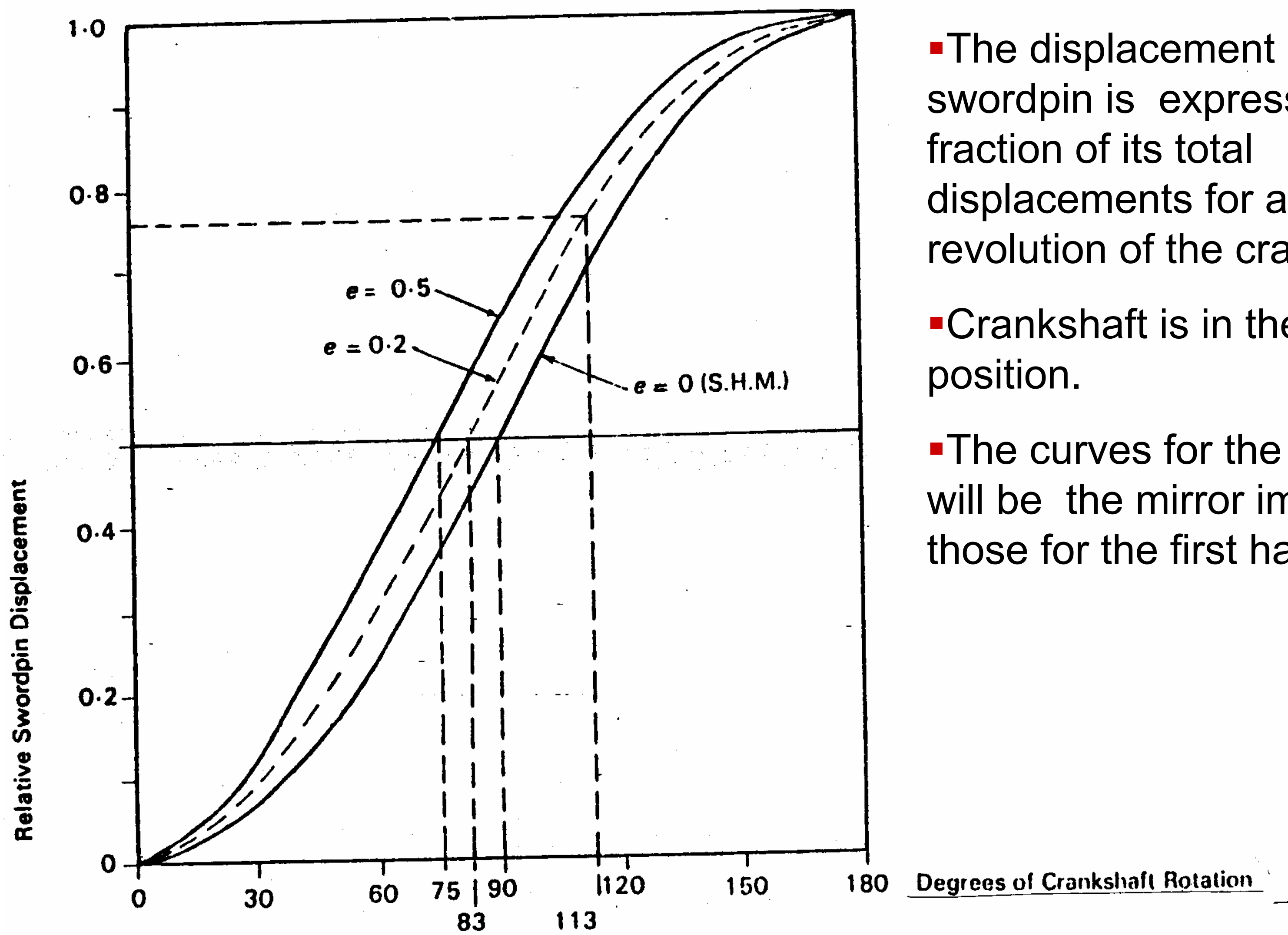
- The swordpin travels along an arc of a circle centered upon the rocking shaft.
  - This modifies the movement of the swordpin and hence of the reed, but, since the radius of the arc (length of the sley sword) is large (about 0.75 m),thus, the effect is small enough to be neglected.
- Relative heights of the swordpin & crankshaft
  - Raising or lowering the crankshaft from its normal position affects both the extent and the character of the motion of the swordpin.
  - Moving the crankshaft 10 cm up or down from its normal position;
    - increases the distance moved by the swordpin by about 8%.
    - increases the swordpin' s velocity as it approaches its most forward position and to decrease it as it approaches its most backward position.
    - The result is increasing the effectiveness of beat-up and of allowing more time for the passage of the weft carrier.

Sley eccentricity, e = r/l

- The ratio ***r/l***, where ***r*** is the radius of the crank circle and ***l*** is the length of the crank arm, is called the **sley-eccentricity ratio ,*e***.
- The larger it is, the greater is the deviation from simple harmonic motion.
- If e increases then,
  - more time is available for shuttle passage
  - more effective beat up (beat up force increases)

    BUT
  - mechanical problems occur on loom parts.

Motion of the sley



- The displacement of the swordpin is expressed as a fraction of its total displacements for a half revolution of the crankshaft
- Crankshaft is in the normal position.
- The curves for the second half will be the mirror images of those for the first half.

Motion of the sley

- With simple harmonic motion (corresponding to e=0 and indefinitely long crankarms), the swordpin attains its maximum velocity and exactly half its maximum displacement at 90^0 and again at 270^0.
- With a finite value of e, with any arrangement possible in practice if the sley is crank-driven, the swordpin attains its maximum velocity and half its maximum displacement earlier on its backward movement and later on its forward movement.

Eccentricity Ratio *(e)*	Positions of Crankshaft at Half Maximum Displacement	Period during which Displacement is at Least Half Maximum
0.0	90^0 and 270^0	180^0
0.2	83^0 and 277^0	194^0
0.5	75^0 and 285^0	210^0

Sley eccentricity, e = r/l

- As the sley-eccentricity ratio increases
  - the sley remains longer nearer its most backward position, and more time is available for the passage of the shuttle.
  - increases the maximum attainable velocity of the sley around beat-up.
- We may summarize the advantages of a high sley eccentricity ratio as follows:
  - *(a)* it facilitates the passage of the shuttle; and
  - *(b)* it tends to increase the effectiveness of beat up.
- The effects of altering the sley-eccentricity ratio within the practicable limits are, however, greater than those obtained by altering the height of the crankshaft.

Sley eccentricity, $e = r/l$

- The disadvantages of a high sley-eccentricity ratio:
  - A high value implies rapid acceleration and deceleration of the sley around beat-up.
  - It increases the forces acting on the swordpins, crankpins, cranks, crankarms, crankshaft, and their bearings, and indirectly on the loom frame.
  - A high sley-eccentricity ratio will therefore demand more robust loom parts and a more rigid loom frame in order to prevent excessive vibration and wear, so that, for a given standard of performances the loom will cost more.

Sley eccentricity, e = r/l

- For this reason, most loom makers tend to avoid eccentricity ratios greater than about 0.3. However, there are exceptions.

Loom Maker	Type	r (cm)	l (cm)	e= r/l
A. Saurer	Cotton, tappet	6.25	15.0	0.42
B. Rűti	Cotton, dobby	7.60	33.5	0.23
C. Picanol	Cotton, tappet	7.20	32.4	0.225
D. Prince (water-jet)	Rayon, tappet	3.33	22.9	0.145
E. Dobcross	Worsted dobby	8.90	43.2	0.21
F. Northrop	Industrial- blanket, tappet	10.80	20.3	0.54

Sley eccentricity, $e = r/l$

- In general, the forces involved in accelerating and decelerating the sley will be proportional to the effective mass of the sley and the square of its velocity.
- For given sley eccentricity ratio, its velocity will be proportional to the product of the loom speed and the length of the cranks.
- A is a typical automatic loom for weaving cotton and spun rayon fabrics and B is a non-automatic loom for weaving heavy woolen industrial blankets.

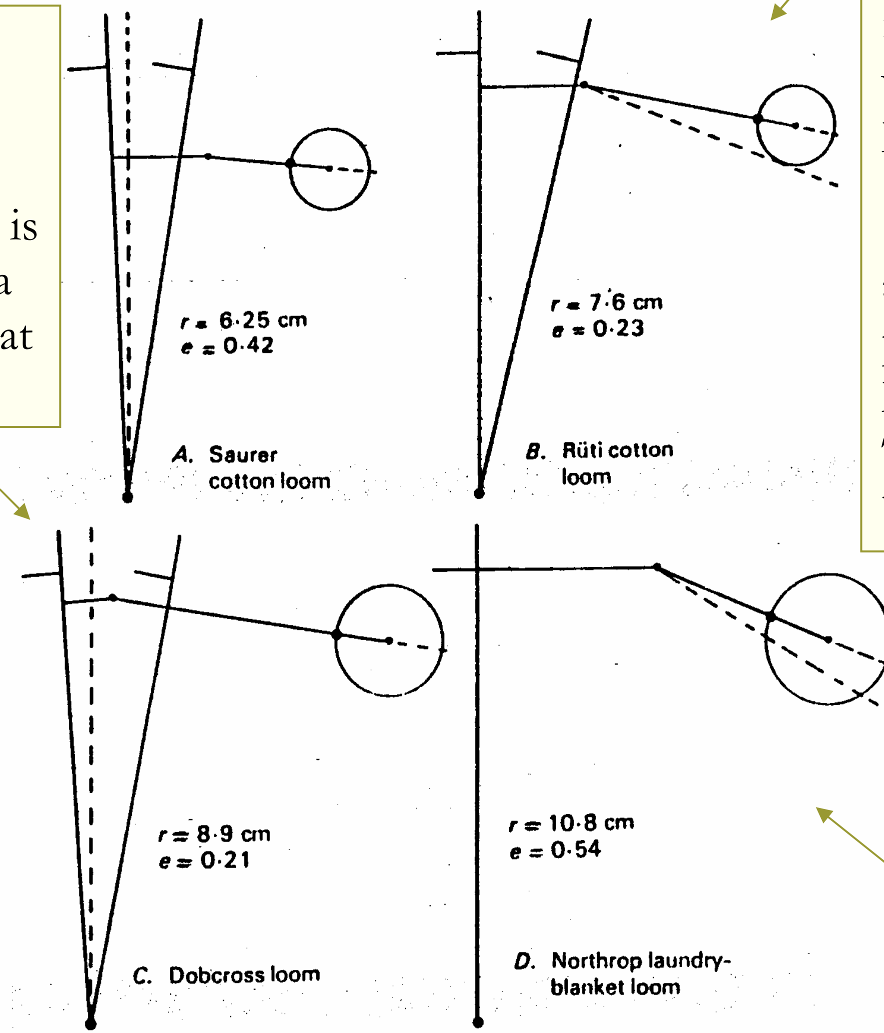
Type	Reed space (m)	Speed (picks/min)	Length of crank (cm)	Mass of sley
Loom A	1.14	220	7.0	m
Loom B	5.33	65	10.8	M

Geometry of the sley

- The Saurer cotton loom with less no.of heald shafts.
- The crank shaft position is normal, and the reed has a slight forward inclination at beat-up

The woolen and worsted loom to control up to 28 heald shafts. The crank is longer.

The reed has a forward inclination at beat-up, and the crankshaft position is normal.



- Accommodation of 20 heald shafts is achieved partly by fairly long crankarms, which give a rather low eccentricity ratio.
- The crank shaft is above its normal position, which would lie on the dotted line. The reed is vertical at beat-up.

A heavy, wide loom with a reed space of 5.33 m. Its very high eccentricity ratio (0.54) is practicable because the loom speed is only 65 picks/min.

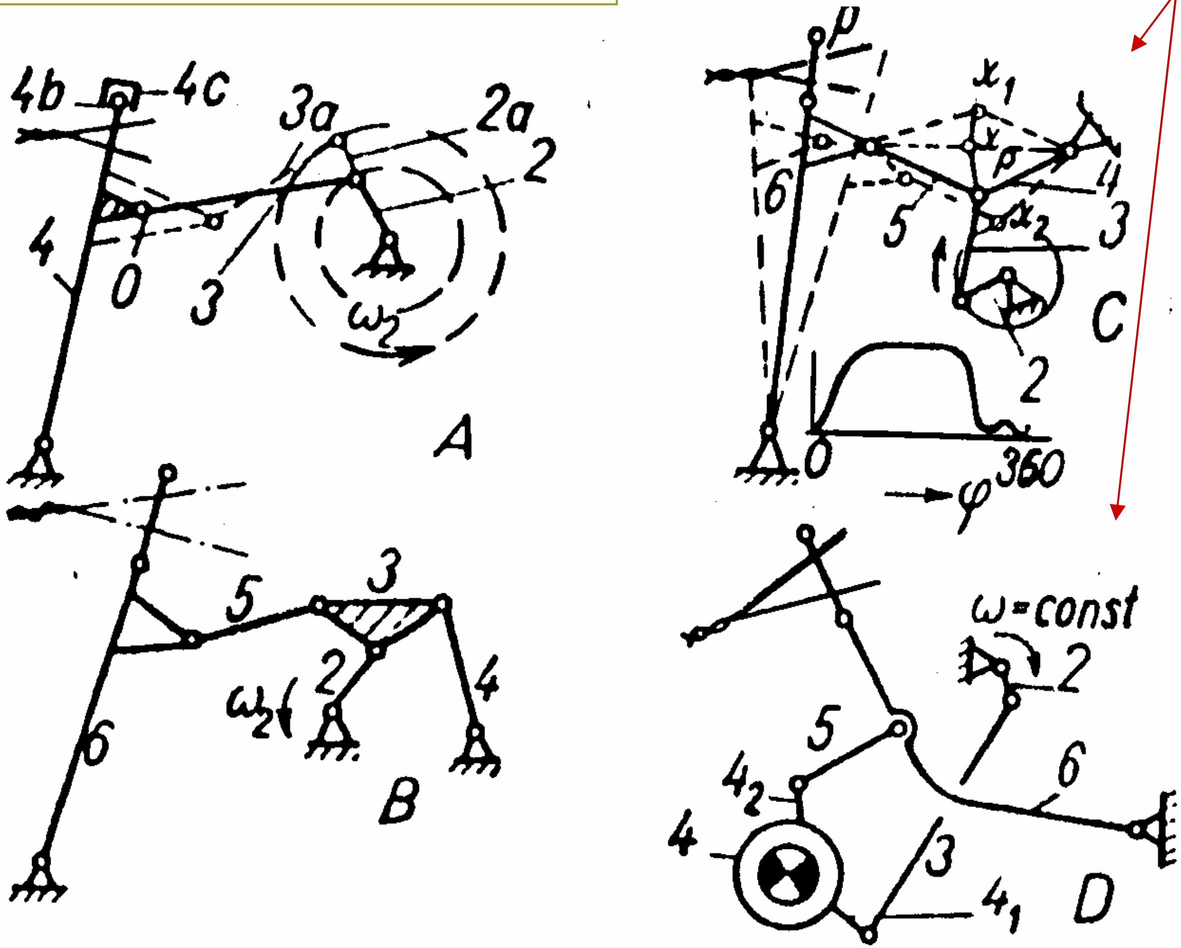
Link-type sley mechanisms (for shuttle weaving and some type of jet machines)

- The sley does not remain at an absolute dwell at the rear dead center position during picking.
- The six-link mechanisms give considerably larger picking angles than four-link mechanisms.
- **C:** It is used in the production of heavy-weight home furnishing fabrics.
  - Link x moves from position x_1 to position x_2 so that it passes through beat-up position x_p twice within one revolution of crank *2*.
  - This link dwells for a longer time in the area of position x_2, which corresponds to the rear dead center of the reed, so that an adequately large picking angle is provided for the shuttle flight through the warp

Link-type sley mechanisms:

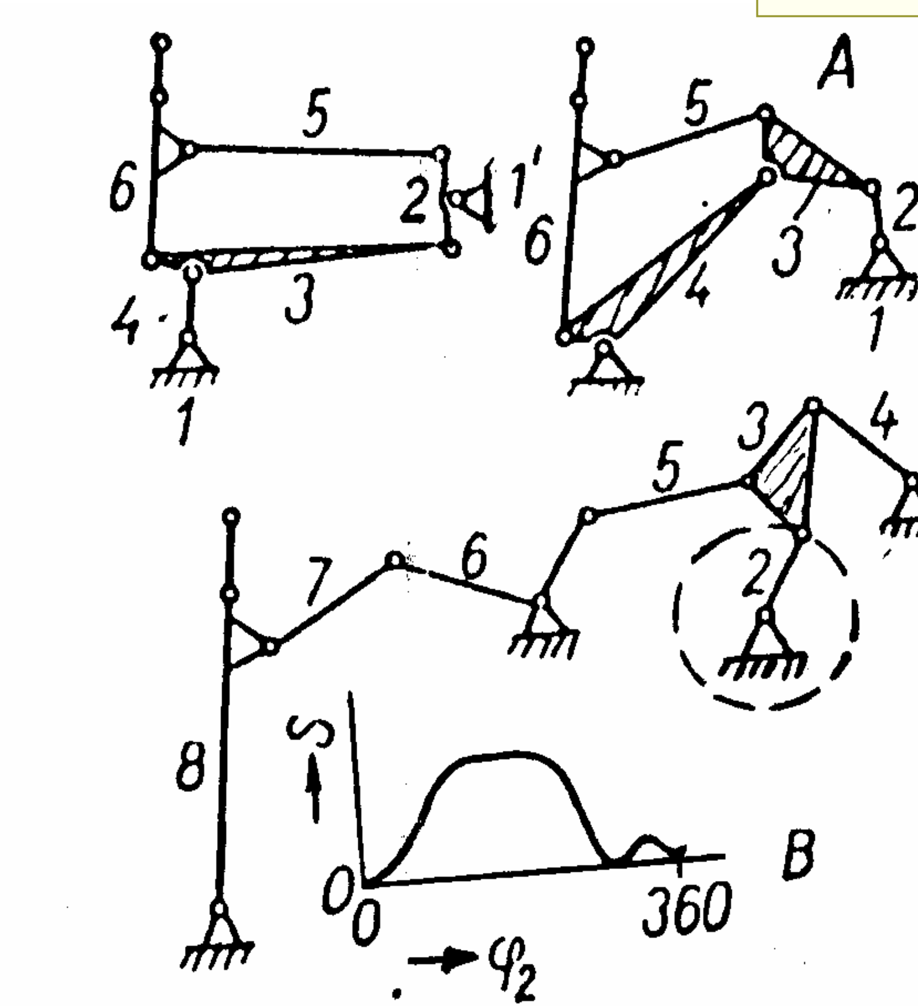
The four-link mechanism: for lower working widths, a long connecting rod; for larger working widths a shorter connecting rod

The six-link mechanisms



Multi link mechanisms

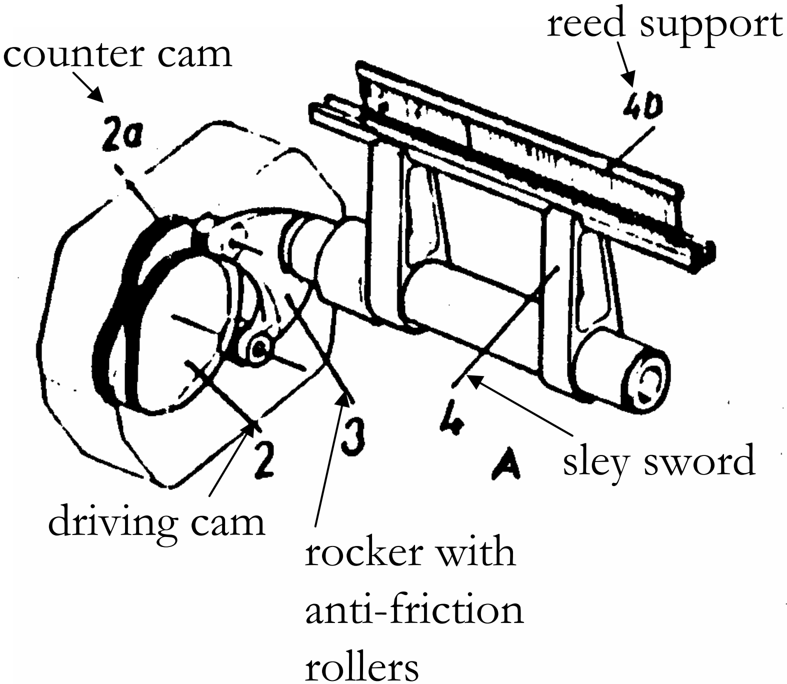
These mechanisms are suitable for the heavy-duty weaving machines of large working widths.

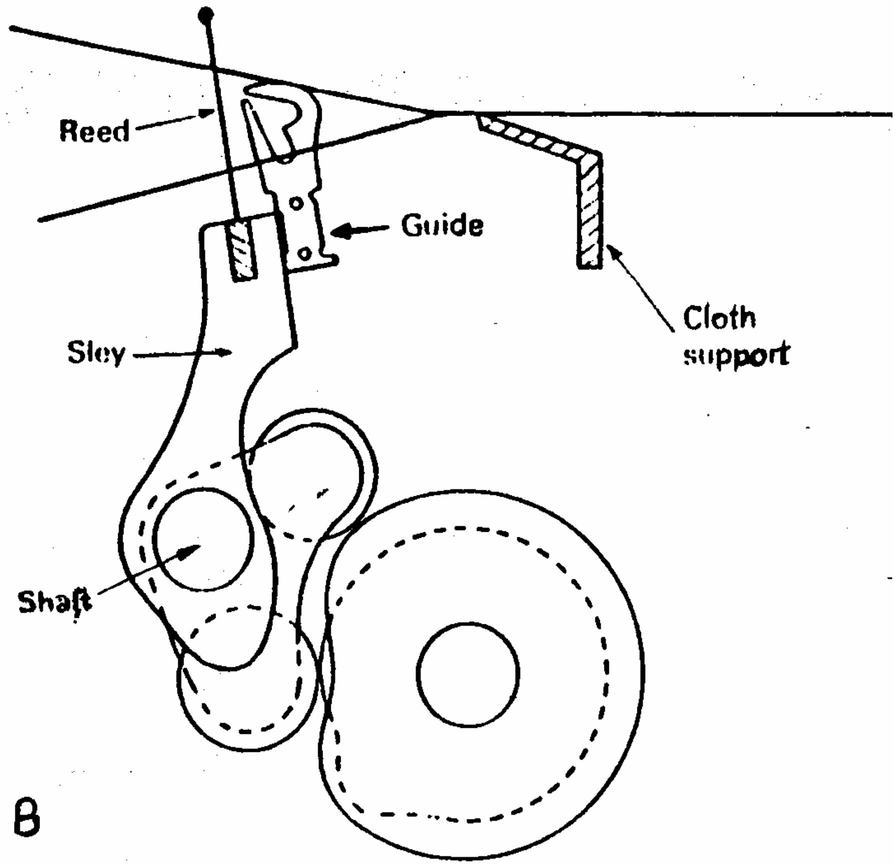


Cam operated mechanisms (for most of the shuttleless weaving machines)

- To achieve high loom speeds on shuttleless weaving machines;
  - the mass of the sley should be reduced to a minimum
  - the distance through which it reciprocates should be as low as possible.
- In order to minimize the weight of the sley, heavy parts associated with picking are mounted on the loom frame except some means of guiding for the weft carrier through the shed.
- Since the device used to carry the weft through the shed will have a smaller cross-section than a shuttle, a smaller shed and hence a smaller sweep of the sley will be sufficient.

Cam drive for sley mechanism on the Sulzer projectile weaving machine





Cam drive for sley mechanism on the Sulzer projectile weaving machine

- The picking mechanism is mounted stationary on the machine frame, then the sley must dwell in its most backward position during the whole of the time occupied by weft insertion.
- Only a cam mechanism can precisely ensure the dwell position within the required range of 220^0 to 250^0.
- Sulzer sley drive uses several pairs of matched cams, spaced at intervals across the width of the sley.
- The motion of the sley, including its period of dwell, is positively controlled.

Cam drive for sley mechanism on the Sulzer projectile weaving machine

- In most models of the Sulzer weaving machine, the whole of the sley movement is completed in 105^0 of the weaving cycle, which thus allows the sley to dwell in its back position for 255^0.
- In the narrow, single-color machines, which run at the highest speed, the sley movement is spread over 140^0 to prevent excessive vibration, which leaves a dwell period of 220^0. This is acceptable because the weft carrier does not travel over a long distance as in the wider machines.

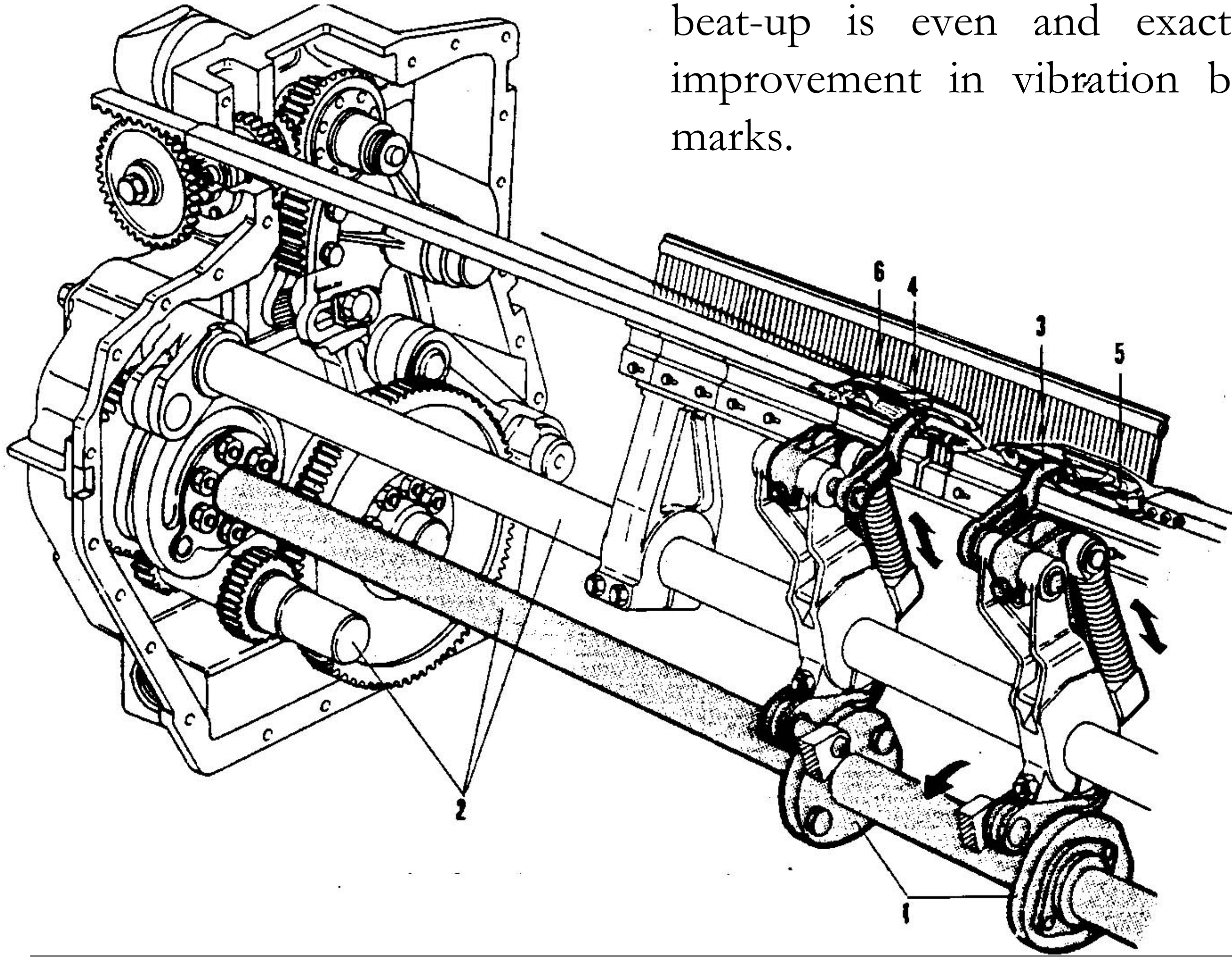
Cam drive for sley mechanism on the Sulzer projectile weaving machine

- The cam mechanism gives the outstanding advantage of a possible cam change for various working widths.
- But the manufacture of this mechanism is very exacting; only a minimum clearance is admissible between both cams with rollers to avoid impacts in the mechanism.
- Moreover, this mechanism occupies a large space in the warpwise direction and makes, therefore, the arrangement of the other weaving mechanisms rather difficult.

Dornier sley drive

Bilateral reed drive with large, fast running connection shaft between the gears.

Together with the stable, low in mass reed construction, beat-up is even and exact. This brings a significant improvement in vibration behavior and eliminates start marks.

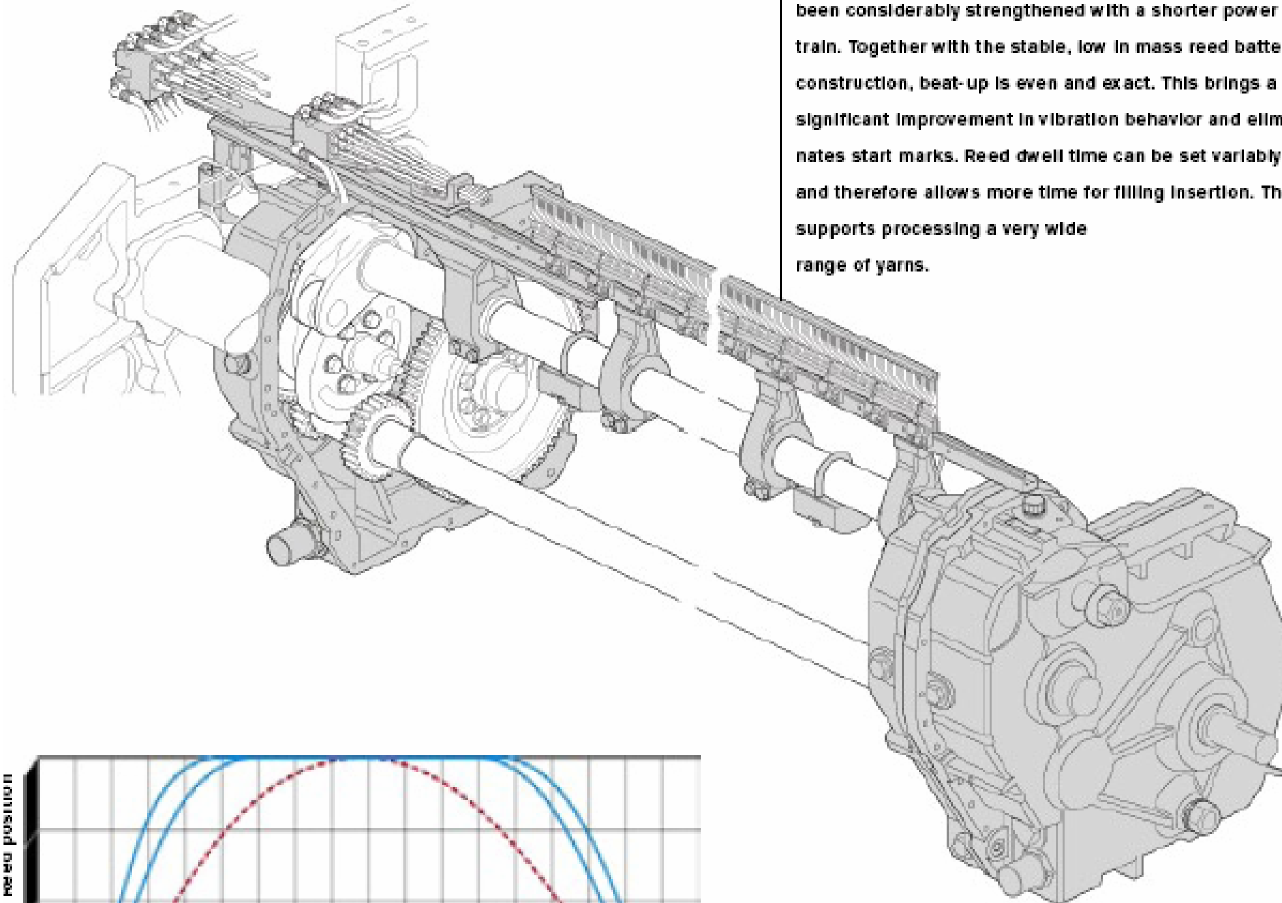


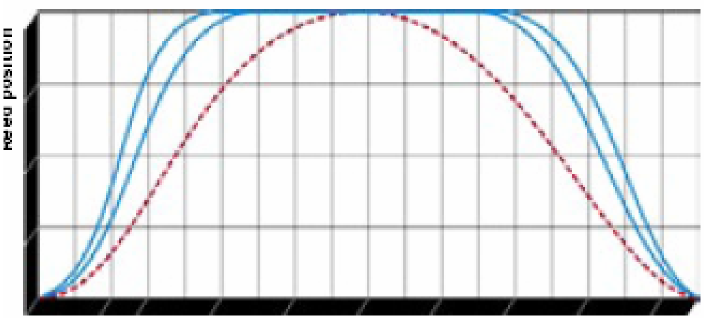
Reed dwell time can be set variably and therefore allows more time for filling insertion. This supports processing a very wide range of yarns.

Two high-precision synchronized gearboxes, one at each side of the machine, provide the drive for filling insertion and reed beat-up.

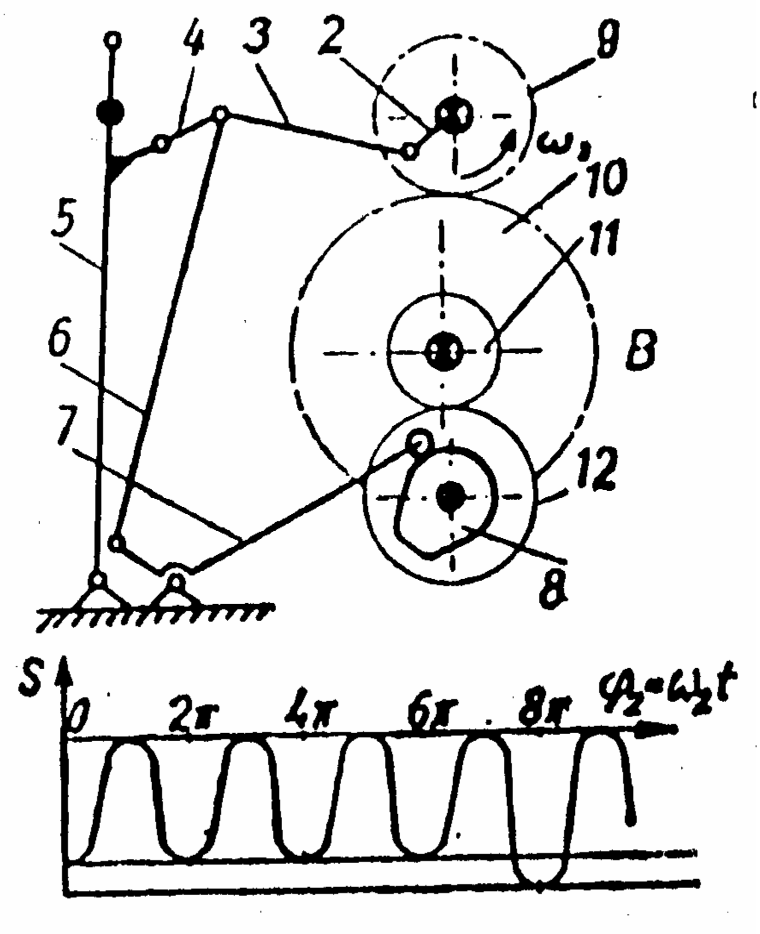
A continuous lubrication system provides for increased performance, low maintenance and high longevity of the new gearbox generation.

Bilateral reed drive with large, fast running connection shaft between the gears. In the AS-type these have been considerably strengthened with a shorter power train. Together with the stable, low in mass reed batten construction, beat-up is even and exact. This brings a significant improvement in vibration behavior and eliminates start marks. Reed dwell time can be set variably and therefore allows more time for filling insertion. This supports processing a very wide range of yarns.





Special beat-up mechanism for terry weaving machines



A combination of kinematic link pairs(*1* — 7) , rolling couples (cam *8* and gear wheels 9, *10*, *11* and *12*) or sliding couples (rocker arms) to suit the given end uses.

$$p = \frac{z_{10} z_{12}}{z_9 z_{11}} = 1:5$$

four dead center positions of the reed will be shorter and only the fifth beat-up will be completed up to the true fell

Note: The Terry Weave or Slack- Tension Pile Method

- In addition to two sets of yarns (warp and weft for ground), a set of warp is introduced to form the piles.
- A set of warps are held in tension for the groundwork of the fabric.
- The tension of warps that form the pile is released at intervals and these warp threads are moved forward by the motion of the reed. The tension is restored, and the next picks inserted causes these warps to form in loops.
- The easiest way to make this construction is to use four harnesses, two for slack pile warps and two for tight ground warps.
- First, pile warps are raised; two fillings are inserted through this shed, but the next one is not beaten up by the reed. The pile warps are then lowered, and a pick is inserted to interlace with the ground warps. After the third pick, all three fillings are pushed to the fell of the cloth.

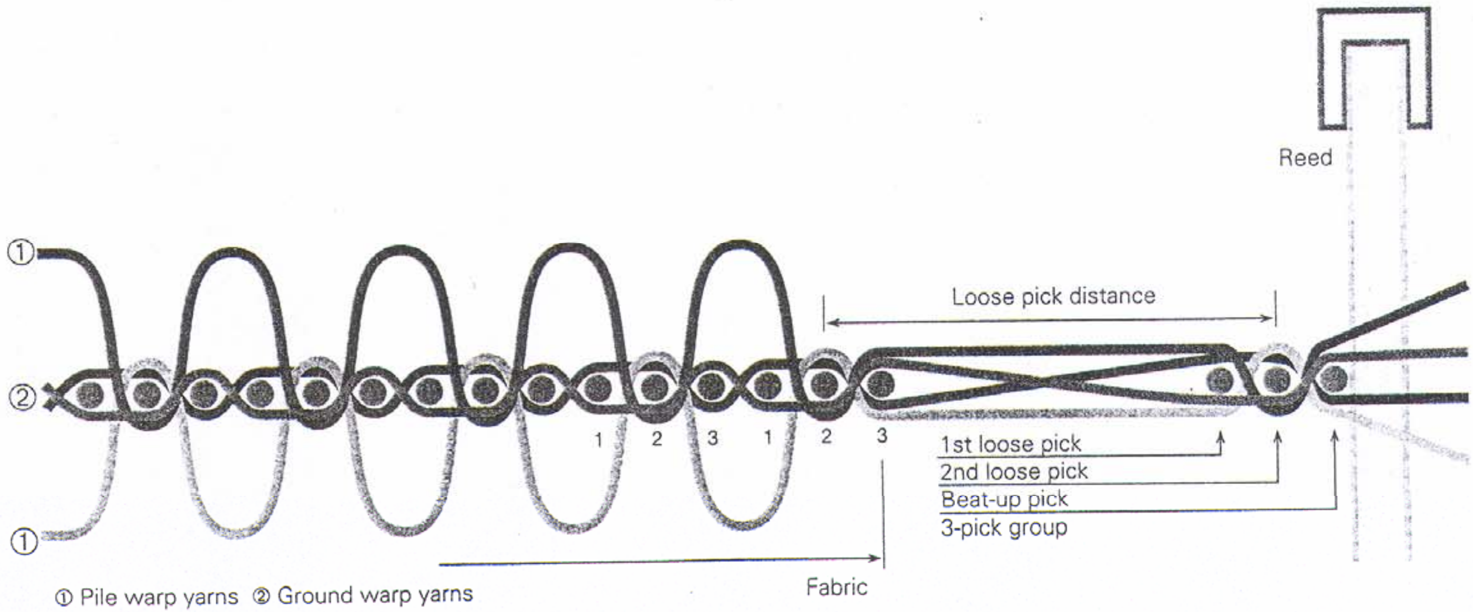
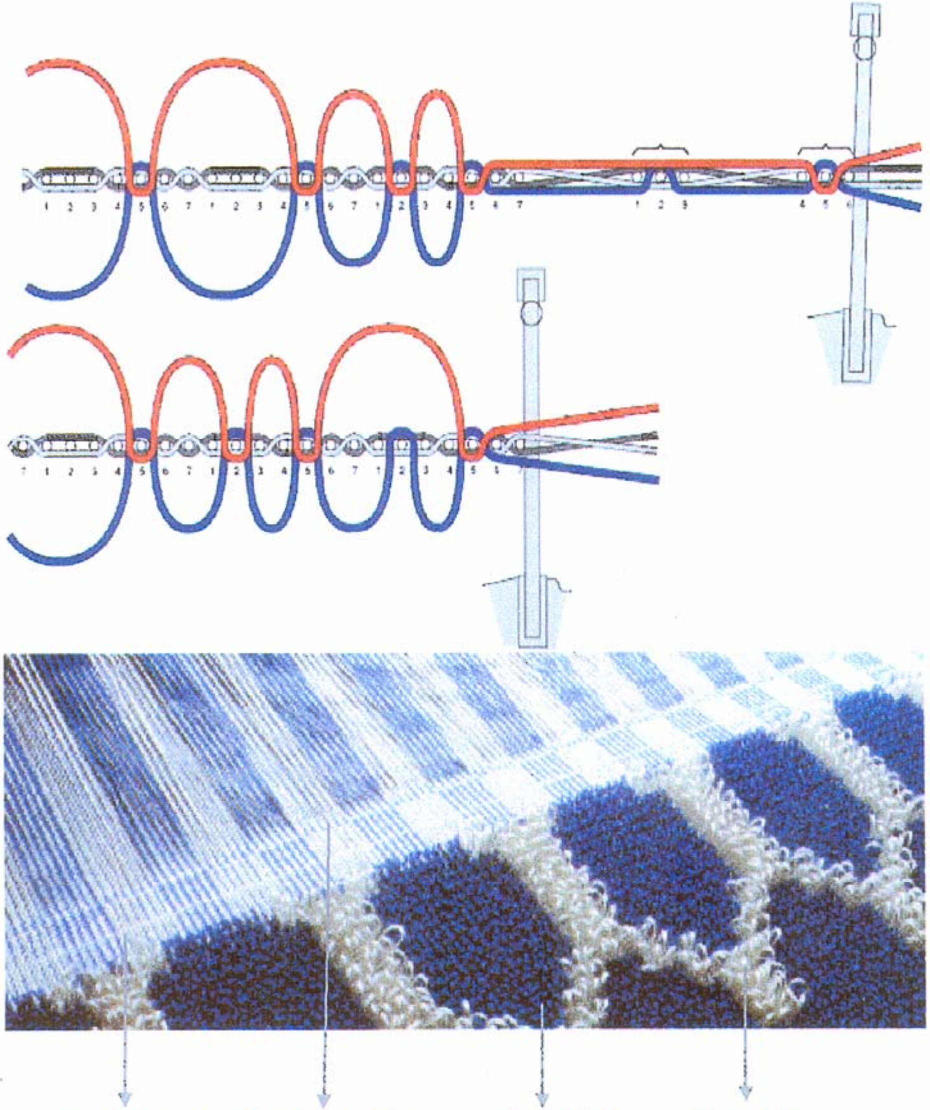
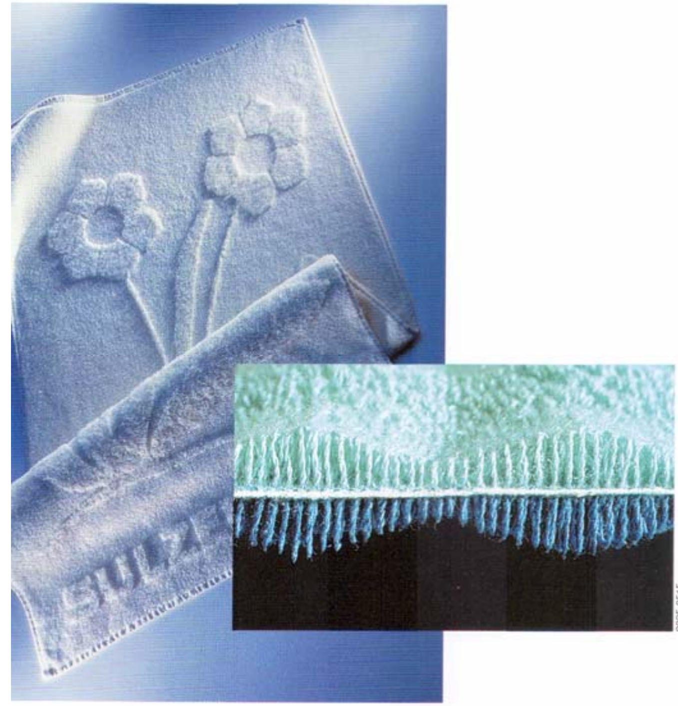


FIGURE 12.2 Structure and origin of a three-pick terry fabric.

- Because the tension on the pile warps is loose when the fillings are beaten up, the pile warps appear in loops. This is known as a three-pick terry cloth because two picks go under the looped pile and one pick goes between two rows of pile.



1. pick group   2. pick group   Low pile   High pile



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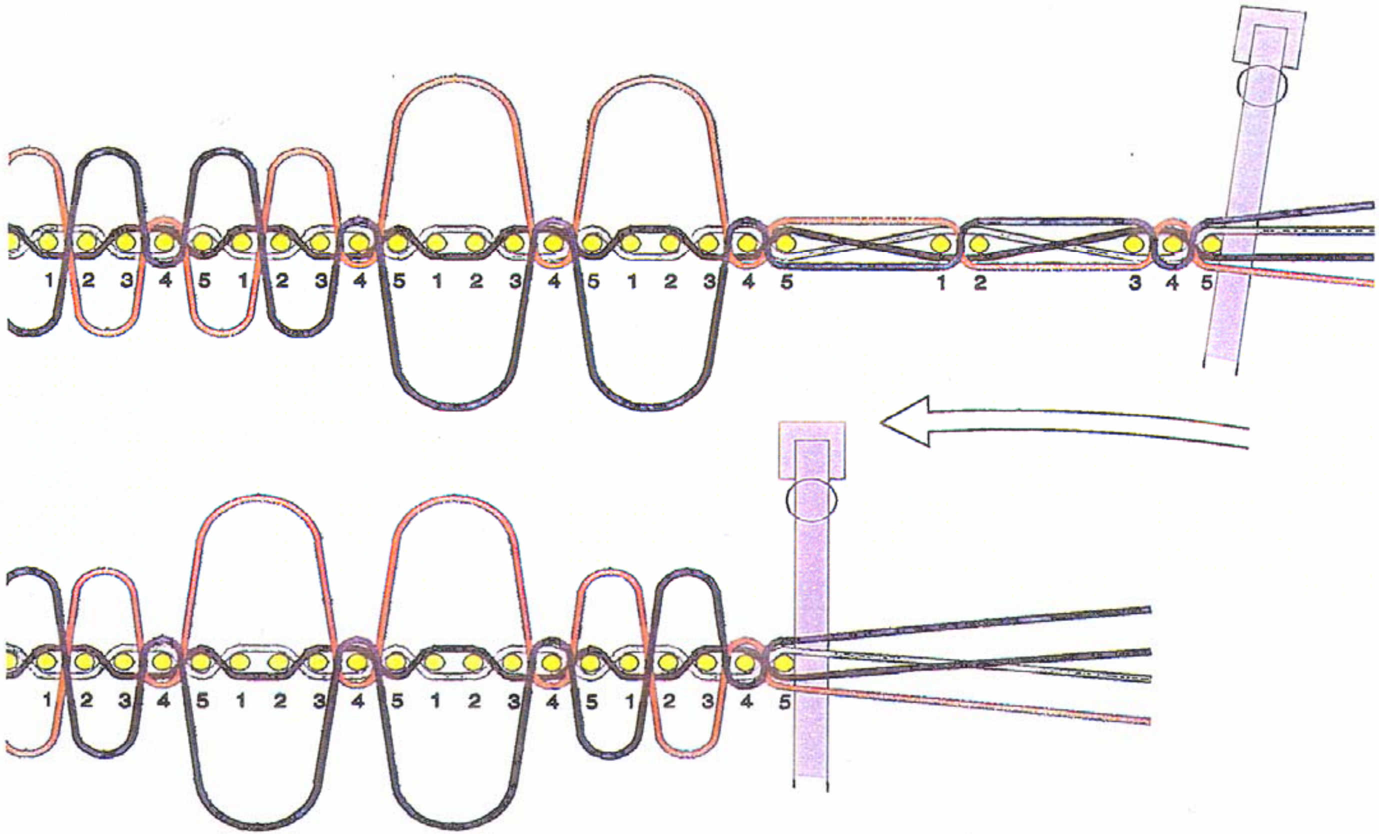
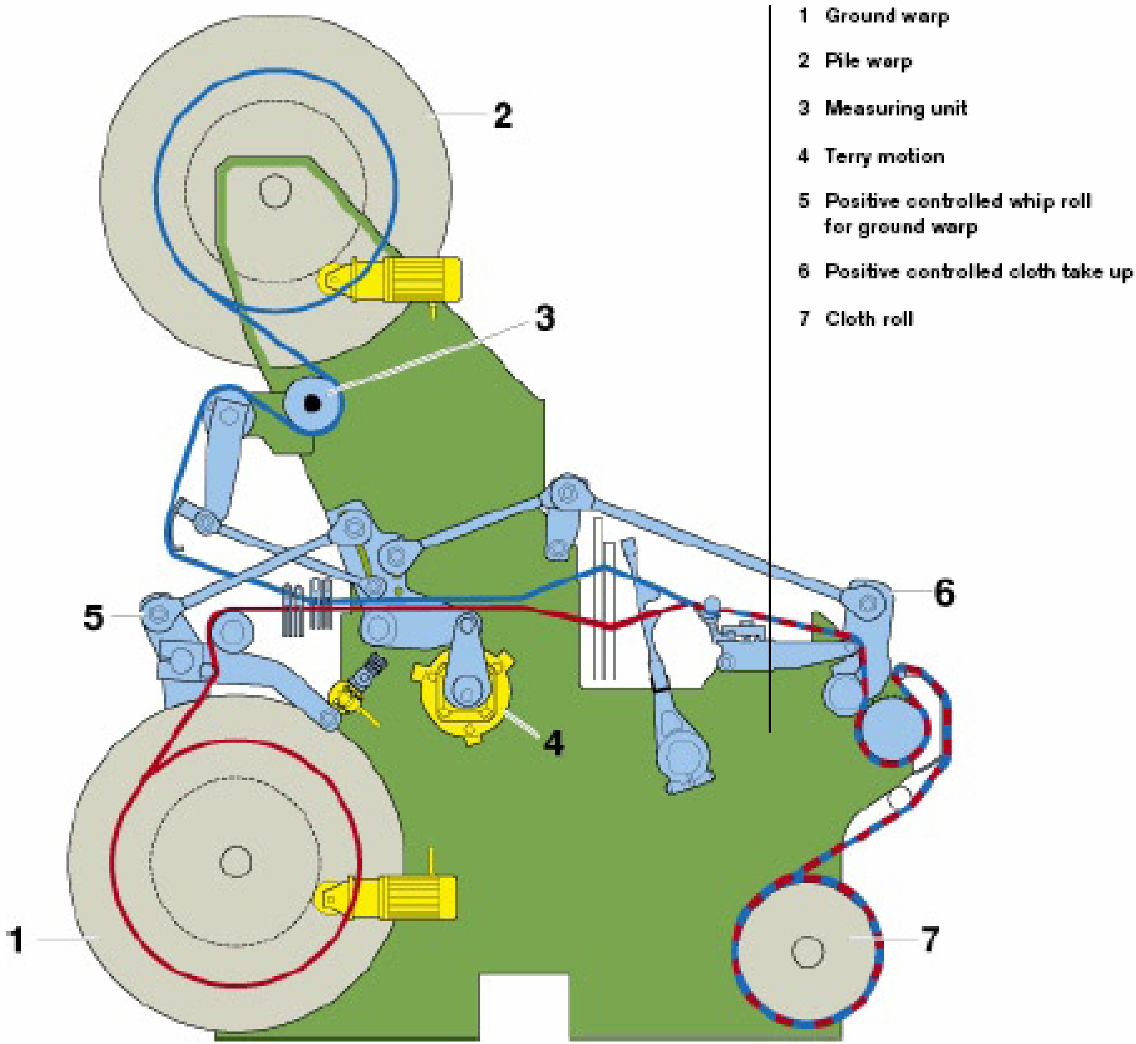
Pattern of a 5-pick-repeat terry fabric with 2 pick batches and one full beat-up.

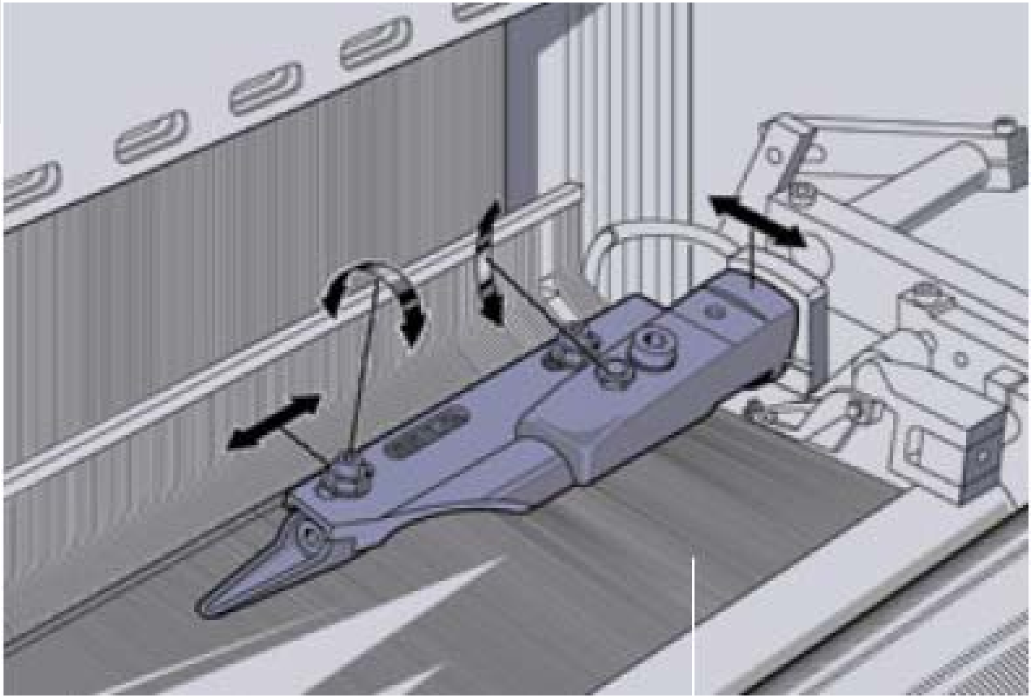


DORNIER air-jet terry weaving machine, ServoTerry®



DORNIER air-jet terry weaving machine, ServoTerry®

- Pile formation is based on the principle of stable, precise cloth control.
- Positive control using a back-rest roll and terry bar in combination with the temples move the fabric to the reed for group beat-up.
- The integral reed drive remains and therefore provides the precision required for the group impacts.
- A compact, simplified back-rest roll system with optimized warp stop motion positioning improves handling and has a decisive influence on reducing warp end breaks.
- High precision in permanent pile warp feed monitoring bring constant pile height, best quality and constant cloth weight.

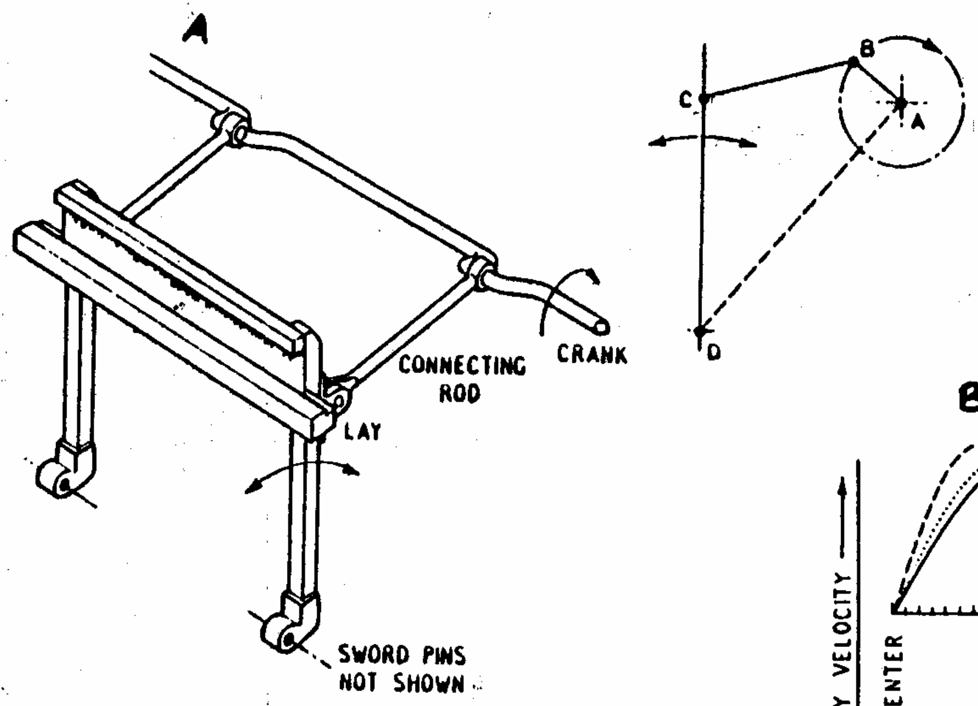


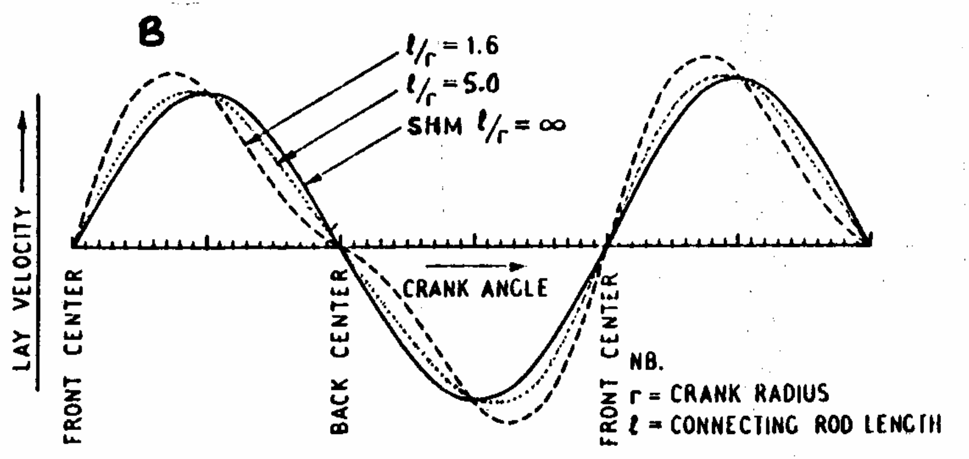
Swivel temples simplify operation and reduce set-up times.

During style and warp changes, the temple cylinders can be swiveled away from their working position and shifted across the cloth width to any position without changing the fine adjustment.

Maximum spreading effect through absolute parallel temple and terry movement.

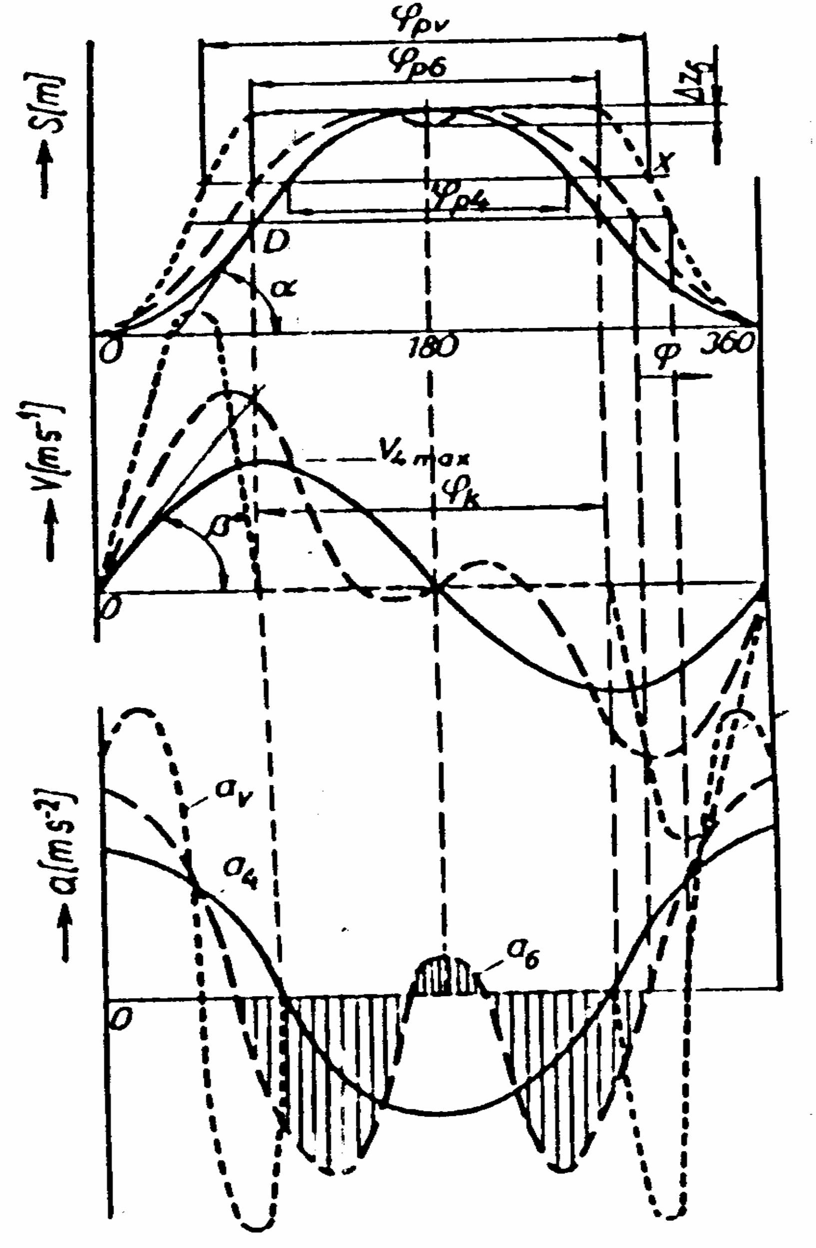
Sley mechanism and its velocity





Effect of various connecting rod length

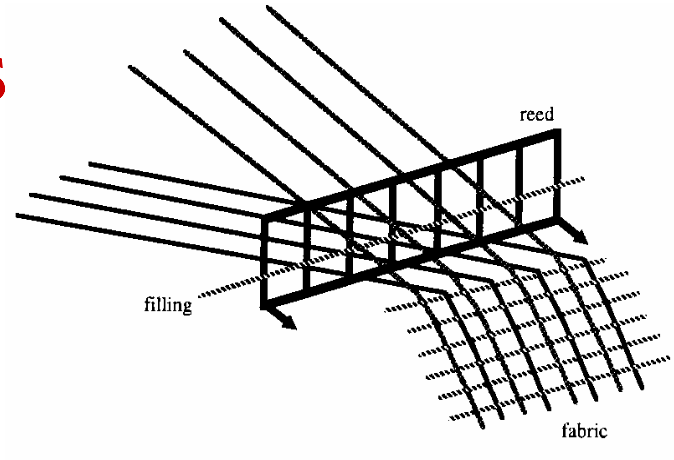
l / r	Connecting Rod	Type of Movement	Type of Fabric
Greater than 6	Long	Very smooth with low acceleration forces	Fine cotton, silk, continuous filament
Between 6 and 3	Medium	Smooth	Medium density cottons
Less then 3	Short	Jerky with high acceleration forces	Heavy cottons, woolen


φpv
φp6
Δz6
S[m]
x
φp4
D
α
0
180
φ
360
V[ms-1]
V4 max
φk
σ
0
a[ms-2]
av
a4
a6
0

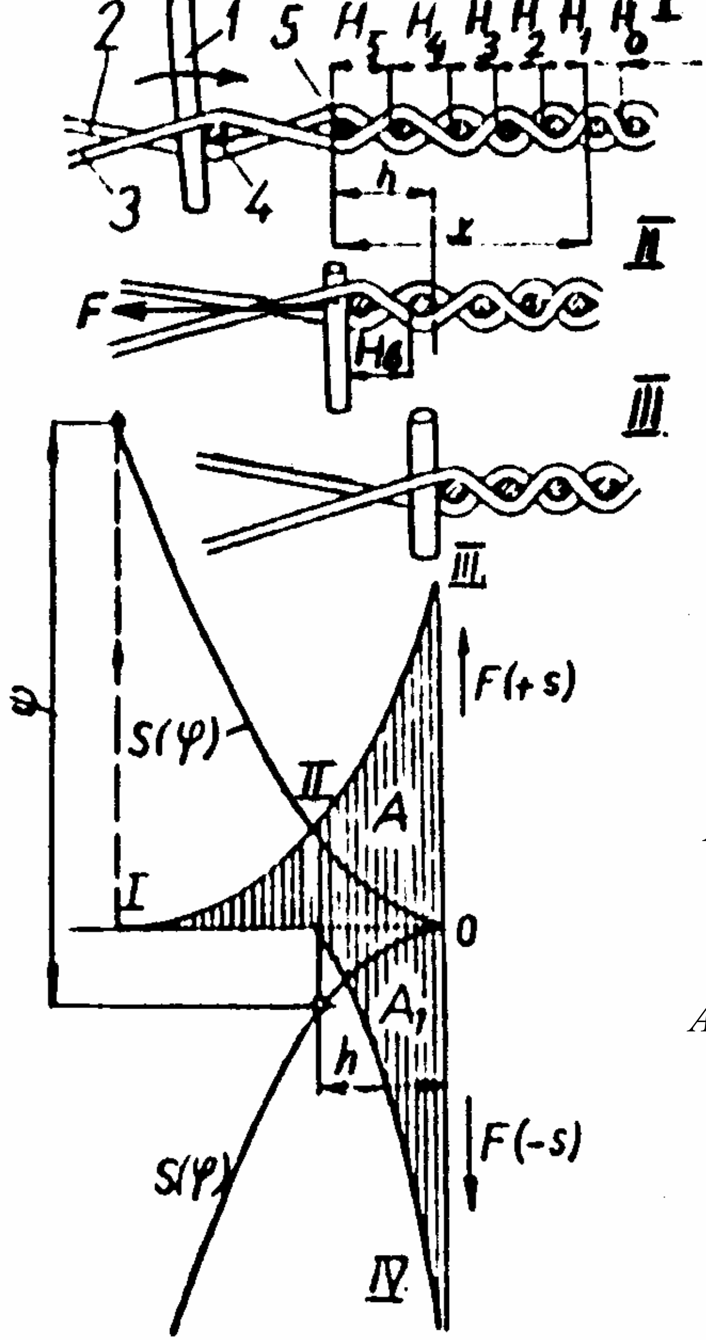
Forces in beat-up process

- Beat-up force
- Warp and fabric tensions
- Weaving resistance

Forces in beat-up process



- Beat-up force (F):
  - The force exerted by the reed onto the warp &cloth system during beat up.
  - The beat-up force must overcome
  - the resistance of the warp ends under tension, open in front of the penetrating weft thread,
  - the frictional resistance between ends and pick as the pick is pushed through the warp sheet.



x: The fabric forming zone

$H5 > H4 > H3 > H2 > H1 > H0 = \text{constant}$

h: the beat-up zone

$$A = \int_0^s F(s)ds$$

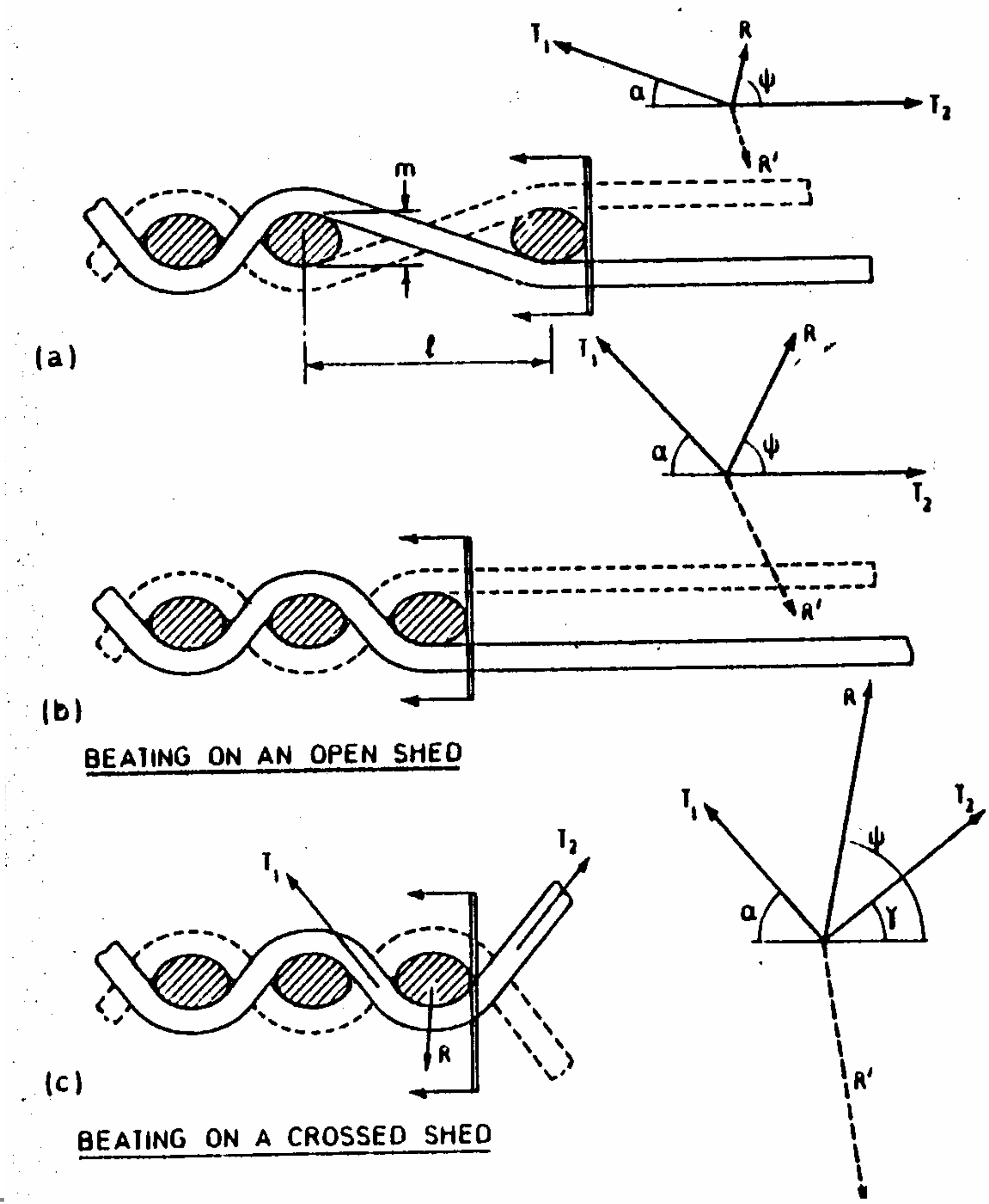
The beat-up work, performed by the reed

$$A_1 = \int_0^h F(-s)ds$$

The passive component of the beat-up work performed by the warp pull during the return motion of the reed

Forces in beat-up process

- Transmitted impulse of force:
  - Different types of beat-up mechanisms have different abilities to transmit adequate impulses of force to the weft beat-up.
  - The impulse of force generated by the reed = mass x speed
  - Sley must also be able to transmit this quantity of motion to the fabric fell.
  - It is consumed for the beat-up.
  - The supplied impulse is dependent on the beat-up angle in which the reed is in contact with the cloth fell.
  - The beat-up angle is adjusted automatically by increasing the beat-up zone so that an equilibrium is attained between the supplied and consumed impulse of force.
  - Increase in no. of picks ► cloth fell tends to advance against the direction of the reed beat up ► increase beat up zone and beat up angle (beat up force).



Yarn tensions on a single end

ψ becomes so acute that the weft would be squeezed out if it were not restrained.

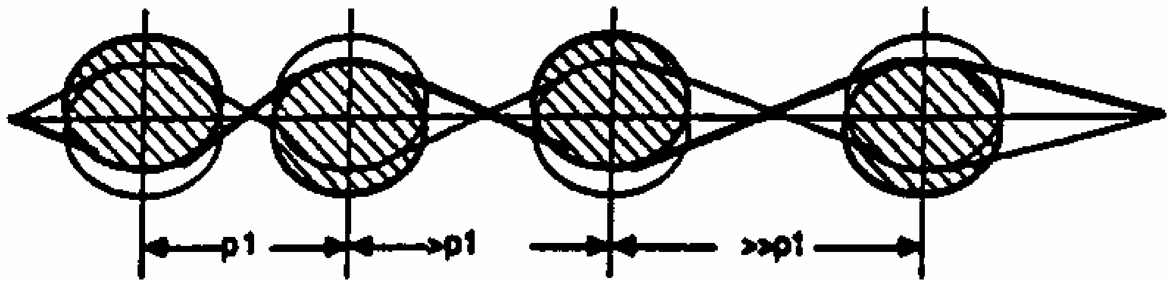
Critical value for ψ is determined by the coefficient of friction.

Thus the minimum pick spacing which can be obtained by beating on an open shed is determined by the coefficient of friction between weft and warp.

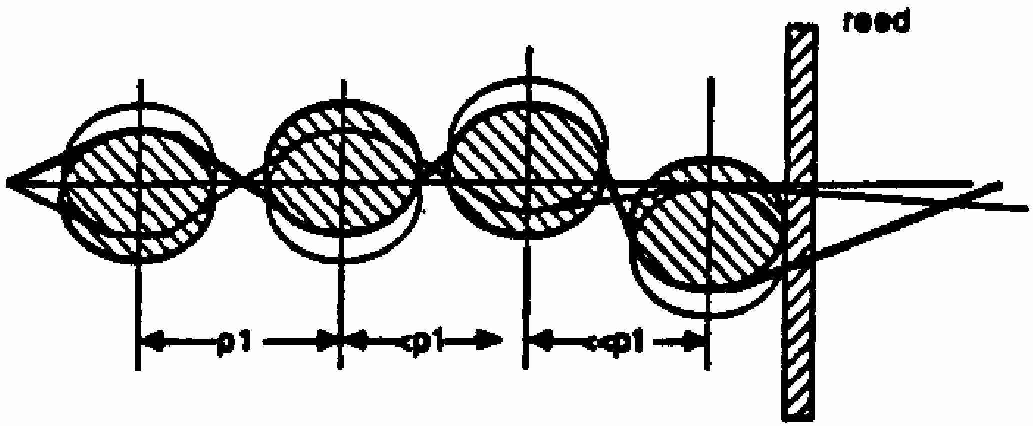
When beating on a crossed shed, γ is more nearly equal to α and there is smaller tendency for the weft to be squeezed out. Hence closer pick spacing can be obtained .

Forces in beat-up process

- Beat up force/end=$2\mu\alpha T_2$
  - μ: the coefficient of friction between ends and picks.
  - α : determined by the crimp levels, the yarn dimensions and pick spacing, the dimensions *m* and *l*.
  - T_2: the tension in the warp is affected by the beat-up, increases with the displacement of cloth fell and, the beat-up force is also a function of T_2 .



a) before the beat-up cycle



b) during beat-up as the reed at its foremost position

Factors affecting the position of the cloth fell

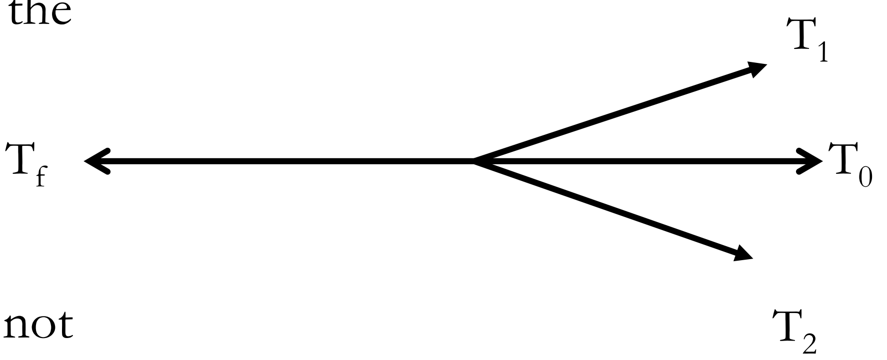
- In weaving fabrics with very low weft cover factors:
  - The reed encounters only a slight resistance due to the friction between ends and pick.
  - It merely pushes the pick to its correct position and leaves it there. There is no movement of cloth fell during beat-up.
- In weaving fabrics with the normal range of weft cover factors:
  - The required pick spacing cannot be achieved unless the reed exerts some substantial pressure on the fell at the beat-up.

Factors affecting the position of the cloth fell

- The beat-up force is the substantial pressure exerted by the reed on the fell at the beat-up.
- The reed can exert pressure on the fell only if the fell offers resistance to displacement. This is called the weaving resistance.
- The fell resists to displace by virtue of tension in the warp and cloth.
- The beat-up force and the weaving resistance are equal and opposite.

Factors affecting the position of the cloth fell

- T_1 and T_2 :the tensions in the upper and lower warp sheets at any time when the fell is not being displaced by the reed – say, just before the reed strikes the fell.
- T_0: the **basic warp tension**, the resultant of T_1 and T_2.
- T_f: the **tension in the cloth**
- T_w: the **tension in the warp**
- $T_w = T_0 = T_f$ **,** provided that the fell is not being displaced by the reed.
- When the reed strikes the fell and displaces it to the left, the warp will stretch and the fabric will contract: T_w will increase and T_f will decrease.



$T_w > T_0$

$T_f < T_0$

Factors affecting the position of the cloth fell

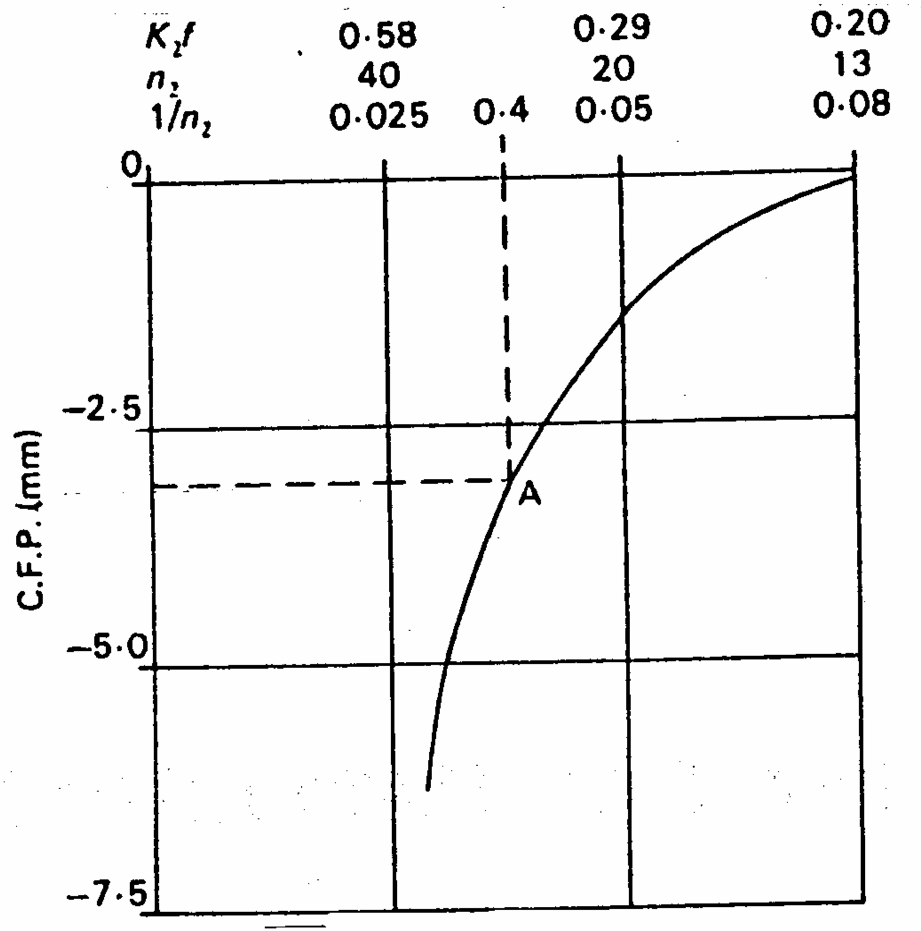
- At any instant during beat-up,
  - The beat-up force=The weaving resistance= T_w - T_f
  - Suppose that we progressively increase the picks/cm while we are weaving a plain fabric, all other conditions remaining the same.
  - The force required to produce the desired pick-spacing will increase with the pick/cm.
  - The extra force required to achieve the closer pick-spacing can only come from an increase in the difference between T_w and T_f due to the increase in the displacement of the fell by the reed at beat-up increases.
  - For a given set of conditions, the displacement of the fell at beat-up must increase as the weft cover factor increases.

Cloth fell position

- The cloth fell position (CFP) can be stated quantitatively (in mm) in relation to the most forward position of the reed.
- In an mathematical approach, the CFP has a negative sign when it is behind the most forward position of the reed.
- A cloth fell position of –7.5 mm, for example, implies that the fell, just before the reed strikes it, will be 7.5 mm behind the most forward position of the reed.
- It follows that the fell would be displaced 7.5 mm at beat-up.

Cloth fell position

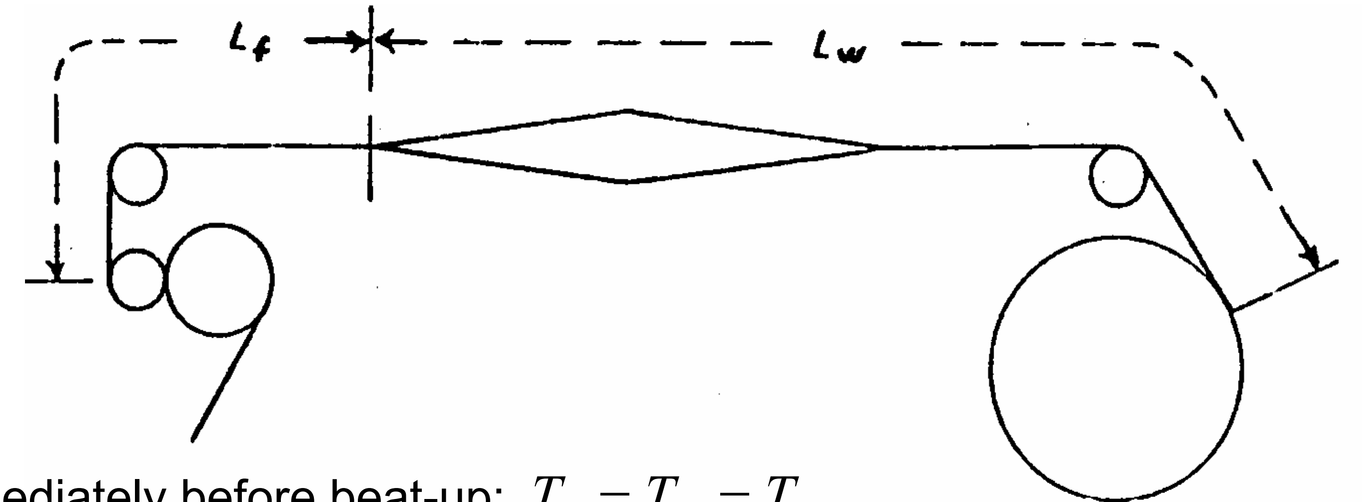
- In a loom weaving 16 tex cellulose acetate warp with 34 ends/cm and a 16 tex cellulose acetate weft with different numbers of picks/cm in plain weave.
- When the fractional weft cover is about 0.4, it is sufficient to give a square firm cloth, corresponding approximately to the point A on the curve.
- Beyond this point, the CFP increases rapidly with increases in fractional weft cover, which seems to approach a limiting value of about 0.58.



The excess-tension theory

- There is a direct proportionality between the extent of beat-up force and the displacement of the cloth fell
  - R= instantaneous weaving resistance or beat up force exerted by the reed on the fell at any instant during beat-up, (T_w - T_f);
  - Z= the instantaneous displacement of the cloth from its basic position;
  - L_w and L_f = the free lengths of the warp and fabric, respectively;
  - E_w and E_f = the elastic moduli of the warp and fabric;
  - T_w and T_f = the instantaneous warp and fabric tensions respectively, at any instant during beat-up; and
  - T_0= the basic warp and fabric tension just before beat-up.

The excess-tension theory



Immediately before beat-up: $T_0 = T_w = T_f$

At any instant during beat-up:
.

$$\left.\begin{aligned} T_w &= T_0 + dT_w \\ T_f &= T_0 - dT_f \end{aligned}\right\} \quad dT_w = E_w \frac{Z}{L_w} \qquad dT_f = E_f \frac{Z}{L_f}$$

$$R = T_w - T_f = \left(T_0 + E_w Z / L_w\right) - \left(T_0 - E_f Z / L_f\right)$$

$$\boxed{R = Z\left(E_w / L_w + E_f / L_f\right)}$$

The peak beat-up force is proportional to the maximum fell displacement (CFP).

The excess-tension theory

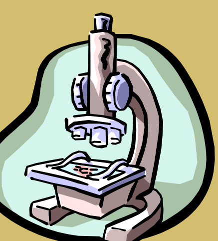
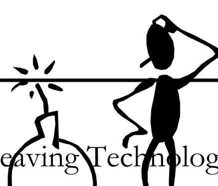
- Under normal (stable) weaving conditions:
  - The basic warp tension, T_0, does not appear in the equation, thus, the beat-up force is independent of the basic warp tension.
  - CFP, just before beat-up, does not change from pick to pick. The introduction of a new pick merely restores the fell to the position that it occupied before take up occurred.
  - It does not matter at what stage in the loom cycle take-up occurs, provided that it always occurs at the same stage.
- But this does not apply to bumping conditions.

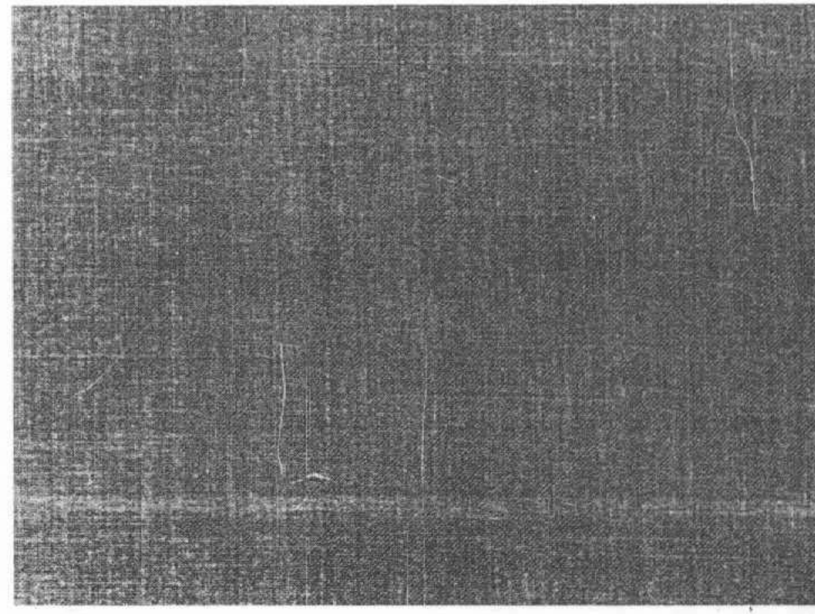
The excess-tension theory

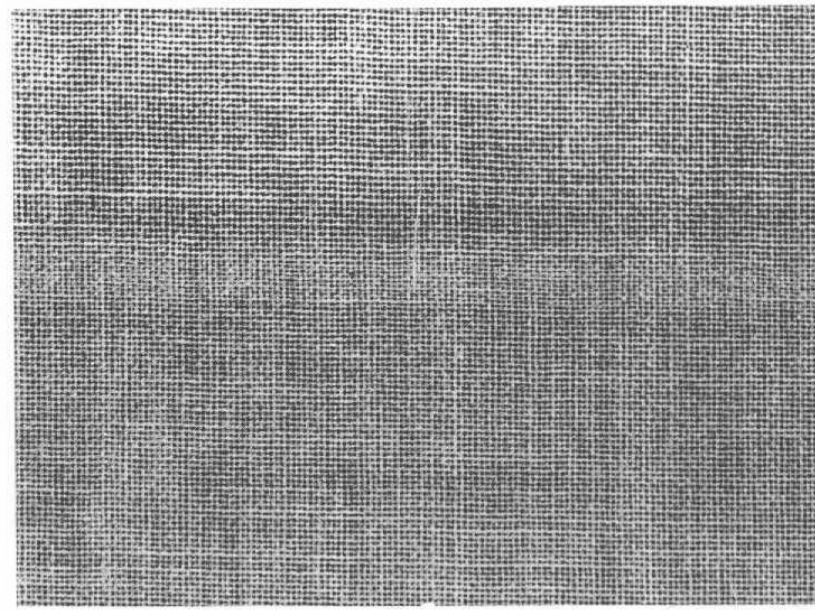
- CFP may change accidentally due to
  - Wrong let-off
  - Wrong take-up
  - Any change in basic warp tension after loom stops
  - Weak beat-up for the first few picks after loom stops because the loom speed
  - Wrong position adjustment after repairing of missing picks

- This disturbs weaving conditions and causes a variation in pick spacing.
- Fortunately, the action of a positive take-up motion is self-correcting, although not instantaneously so, and, if the disturbance is temporary, the fell will soon resume its normal position.
- In the mean time, however, a fault is likely to appear in the fabric, because any change in the cloth-fell position will produce a change in pick spacing.

STIRIPE (ST)

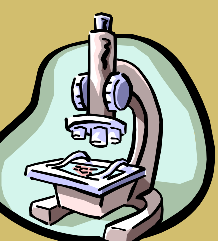
lternative erms, or ther types f faults cluded 	weft stripe, weft streak weft bar, pick bar, starting mark standing place, pulling-back place irregular weft density, repping set mark thick place
efinition 	Excessive weft density
ppearance 	The compaction of the threads creates a difference in shade or brightness. This stripiness fault usually extends across the full width of the fabric.
ossibility of epair	Cannot be repaired ! 

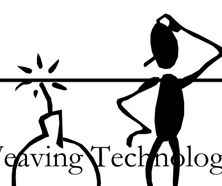

STRIPE

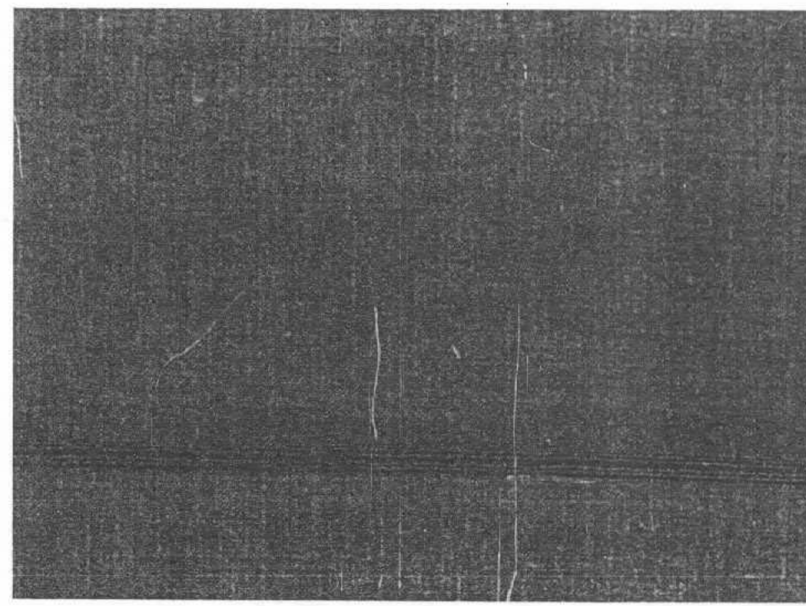

STRIPE

Weft way Faul

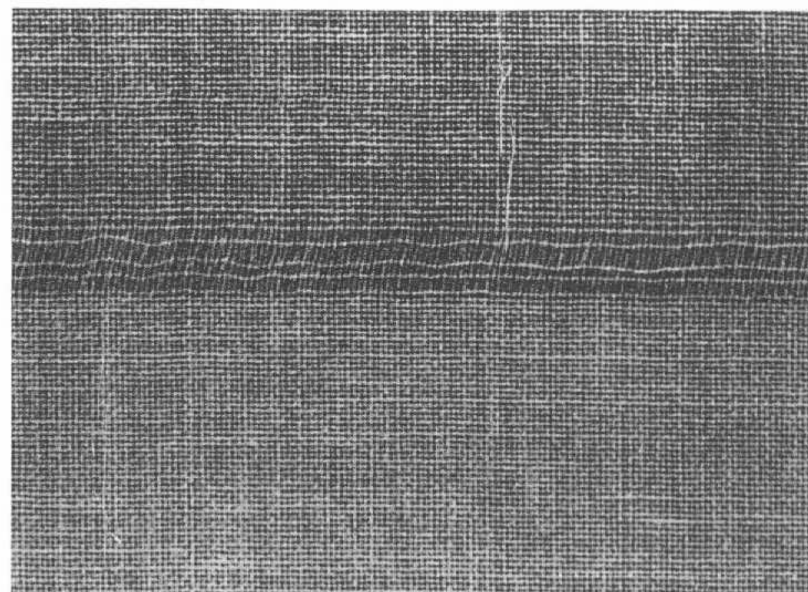
HIN PLACE (TH)

lternative erms, or ther types f faults cluded 	starting mark standing place pulling-back place irregular weft density repping set mark
efinition 	Insufficient density of weft threads
ppearance 	Visible as a partially translucent place in the fabric. In extreme cases there are only a few weft threads per centimeter present. This stripeness fault usually extends across the full width of the fabric.
ossibility of epair	Cannot be repaired



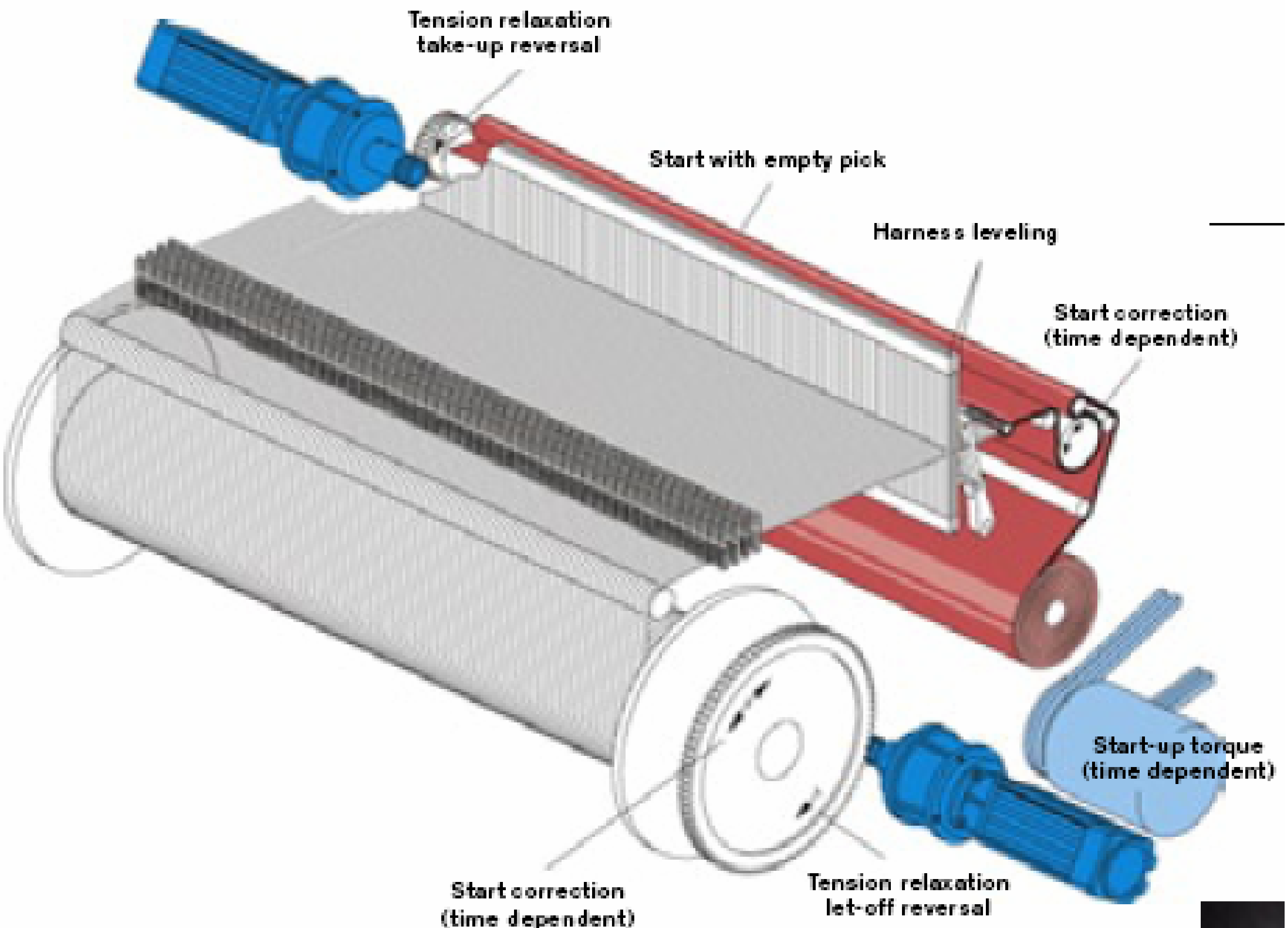


THIN PLACE



THIN PLACE

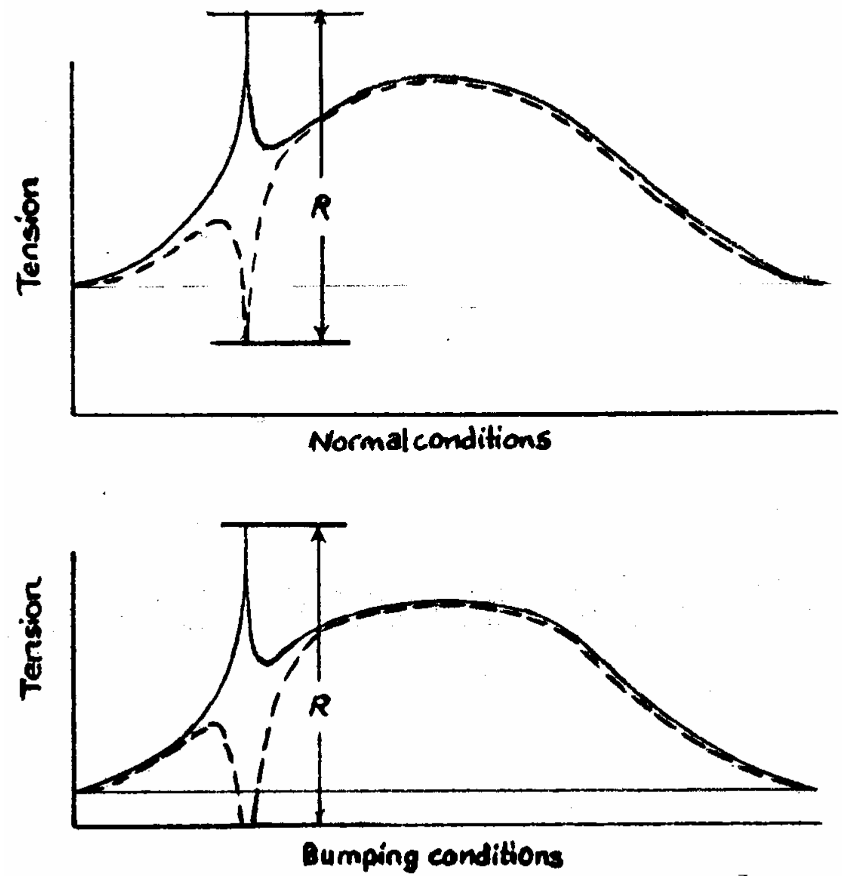
Weft-way Faul



Automatic Start-mark Prevention ASP: Preventing start-marks at the source. The simple functionality of automatic start-mark prevention saves time and significantly contributes toward quality improvement. All the functions outlined in the illustration can be simply called up on the machine display and changed as required, including the patented AE-function (dynamic start-up)

Bumping conditions: weaveability limit

- If the displacement of the cloth fell by the reed at beat-up is quite large, the cloth tension at beat-up will be reduced to zero, and the cloth will be momentarily quite slack.
- This condition is known as bumping.
- It is most likely occur in weaving near the limiting value of the fractional weft cover.
- It is easily recognized by the noise the cloth makes when it suddenly becomes taut again as the reed recedes.
- Bumping also indicates a "jammed" fabric.



Cure for bumping

- An increase in the basic warp tension increases the effectiveness of beat-up and cloth can sustain a larger displacement before it becomes slack.
- It is clear that, for any particular fabric and weaving conditions, there will be a certain value of basic warp tension that will be sufficient to prevent bumping.
- There is no reason to apply a much higher warp tension than this, with the probability of an increase in the warp breakage-rate
- In weaving very hairy yarns in cloths with low fractional weft covers, for example, the minimum warp tension necessary to form a clear shed may be more than is required to prevent bumping.

Reeds

- The reed is one of the principal weaving tools.
- On the high speed shuttleless weaving machines the reed performs 5 to 10 million beat-up movements per month on the two shift basis.
- The reed dents must not deflect nor may the dent surface be damaged.
- The dents are made of high quality steel of rectangular cross section with rounded-off edges, or of oval cross section.
- The hardened reed dents are used if the weft carrier is guided by the reed.
- Reed dents used with the water-jet weaving machines are of stainless steel.

Reeds

- Reed number: Number of dents per unit length measured along the reed

  Unit: dents/dm
- Denting (Reed Plan)

  Number of warps per dent