Textile

V. sem.

DOBBY SHEDDING.

Dobby is a shedding device placed on the top of a loom in order to produce a figured pattern by using a larger number of healds than the capacity of a tappet. In fancy weaving, the dobby is use to produce small figures by means of warp threads and healds.

SCOPE OF DOBBY :→

The scope of dobby is limited between the use of tappets and jacquards when the no. of shafts to be controll or the picks to a repeat of the design is beyond the range of a shedding tapp but at the same time too small to be economically produced by a jacquard, a machine is employed which is known as "DOBBY". The no. of shafts which can be actuated by a dobby varies between 6 & 40

USES OF DOBBY :→

1. In the cotton industry, 24 shafts dobbi are in use. 16 and 20 shafts are mostly used.
2. In the worsted industry, dobbies with 31 jacks are in use. and many of them are positive in action and on that account specially suited for heavy shedding.
3. Dobbies are also extensively used for weaving twills, sateens and other simple weaves within the range of tappets, owing to the advantage that any no. of shafts within their capacity may be used with

greater facility and without extra cost of trouble, but with more consumption of pow

4. The change of pattern in the cloth on a dobby loom can be readily done; whereas it is labourious and expensive in case of a tappet loom and requires more time but a tappet loom gives better shedding and produces better quality of cloth.

CLASSIFICATION OF DOBBIES :→

Some of the fundamental considerations involved in the design of a dobby or its position on the loom, figuring capacity depth of shed, reversible motion of healds and speed of operation.

(i) Single acting or single lift dobbies.
(ii) Double acting or double lift dobbies.
(iii) Positive dobby
(iv) Negative dobby

SINGLE LIFT DOBBY :→

Single lift dobby is now out of use in cotton industry. But it is generally used in weaving silk, rayon and certain classes of gauze fabrics in slow-running looms and handlooms. < For one revolution of the bottom shafts, one pick is inserte

Chief characteristics of single lift dobbies a

(i) It forms a bottom closed shed.
(ii) Each jack controls a single heald.
(iii) This dobby is driven from the crank shaft of the loom.

DEFECTS :→

(i) High strain is put on the warp yarn

ii) The speed of the loom is low.
iii) High power consumption with low o/p.
iv) Heavy wear and tear of the working parts

DOUBLE LIFT DOBBIES :→

Most dobbies now used in the cotto industry are double lift principle. Double lif dobbies posses advantage over single lift dobbies, because in single lift a lag barrel actuates a set of hooks once for two revolutions of the crank shaft; the time for selecting a fresh series of hooks is thus doubled. < For every one revolution of bottom shaft, two pick is inserted in double lif dobby >.

CHARACTERISTICS OF A DOUBLE LIFT DOBBY :→

1. It forms an open shed, thereby the healds are required to move from top to bottom & from bottom to top when the pattern requires a change.
2. The weft is beaten up in a crossed shed; and thereby the warp and weft are corrugated. Large no. of picks can be inserte per inch or cm in the cloth. The cloth becomes compact and the cover is improve
3. Less strain on warp yarns.
4. It requires less time to produce a shed
5. Less wear and tear of working parts.
6. Better equillibrium of rising and lowering healds.
7. Steady working of the machine, thus its life is prolonged.

POSITIVE DOBBY:→

Positive dobby is one which raises and lowers the heald shafts without the use of a reversing motion. They are used for weaving heavy cotton, woollen and worsted fabrics and on high speed looms.

NEGATIVE DOBBY:→

Negative dobby is one in which it controls the heald shafts in one direction. They can either raise or lower the heald frame. Most of the dobbies are mounted on the top of the loom and therefore they lift the heald frame. They reversing is carried out by springs, elastics or a special reversing motion. Negative dobbies tend to be simpler and because they are satisfactory except for heavy fabrics and high loom speeds, they are common than positive dobbies except in woollen and worsted weaving and for high speed unconventional looms.

Although several types of dobbies are marketed, the "Keighly dobby" manufactured in England has become very popular because of its simplicity and reliability. This dobby can be used for weaving from finest silk to the heaviest upholstry fabrics without much problem.

DOUBLE LIFT NEGATIVE DOBBY:→

DOUBLE LIFT SINGLE JACK:

Keighley double lift negative dobbies are of two types: Viz single jack and double jack. Single jack dobby during lifting, gives a lateral movement to the healds. Various atten had been made to overcome lateral movement Ultimately solution has been found by usin two jacks. Working of the two dobbies are exactly the same expecting the connection of jacks. Double lift double jack dobby is also referred as "climax dobby".

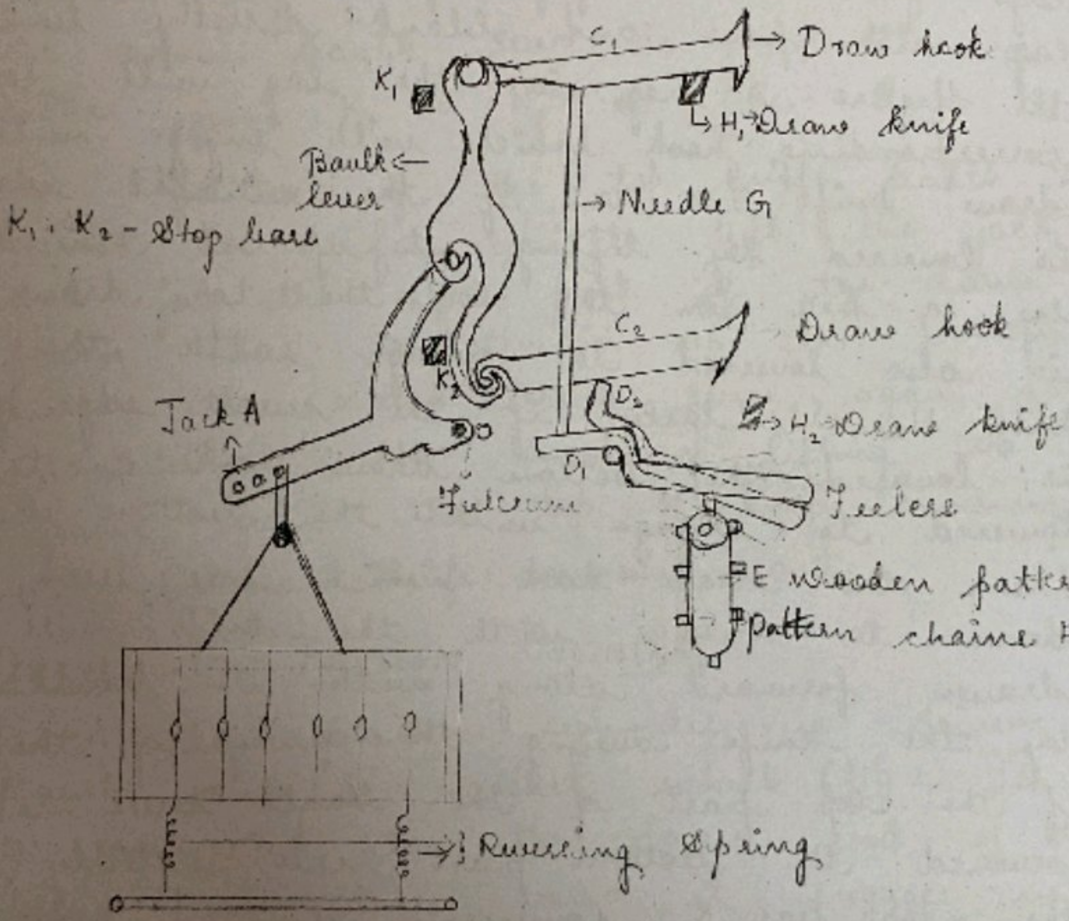


Fig 1 → Double lift Single Jack

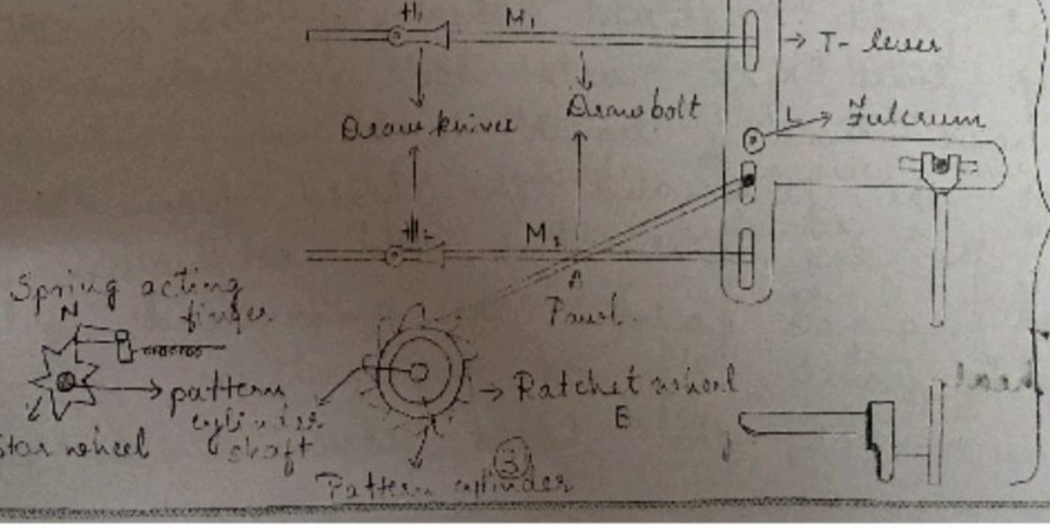


Fig 2 T- lever and Pattern Cylinder Drive

WORKING OF KEIGHLEY DOBBY :→

When the loom is started, the T-levers swings, reciprocating the knives through draw levers and the knives complete one reciprocation every two picks because they are driven from the bottom shaft. Simultaneously with the movement of the knives, the pattern cylinder with the lags move one eighth of a turn bringing the lag with pegs and blank- directly beneath the feelers. A peg in the lag will lower the corresponding hook which will engage with the draw knife. For ex:, if the straight edge feeler is lowered by lifting it up at the back by a peg on the lag, the top draw hook is also lowered to engage with the top knife H_1. Similarly if the curve edge feeler is lowered, the bottom draw hook C_2 is lowered to engage with the bottom knife H_2. When the draw hook which has been dropped down to engage with the knife will be drawn forward along with its baulk lever by the knife during the sweep of the T-lever. If the top part of the baulk lever is pulled forward the bottom part rests solidly against the stop bar K_2. Conversely, if the bottom part of the same lever is pulled forward the top part rests against the stop bar K_1. Thus the stop bars K_1, K_2 acts as a fulcrum for the forward moving baulk levers, where in turn lift the jack and the heald frame. A blank in the lag will keep the respective draw hook raised above the knife and so the heald frame is not lifted.

If the heald frame is to remain

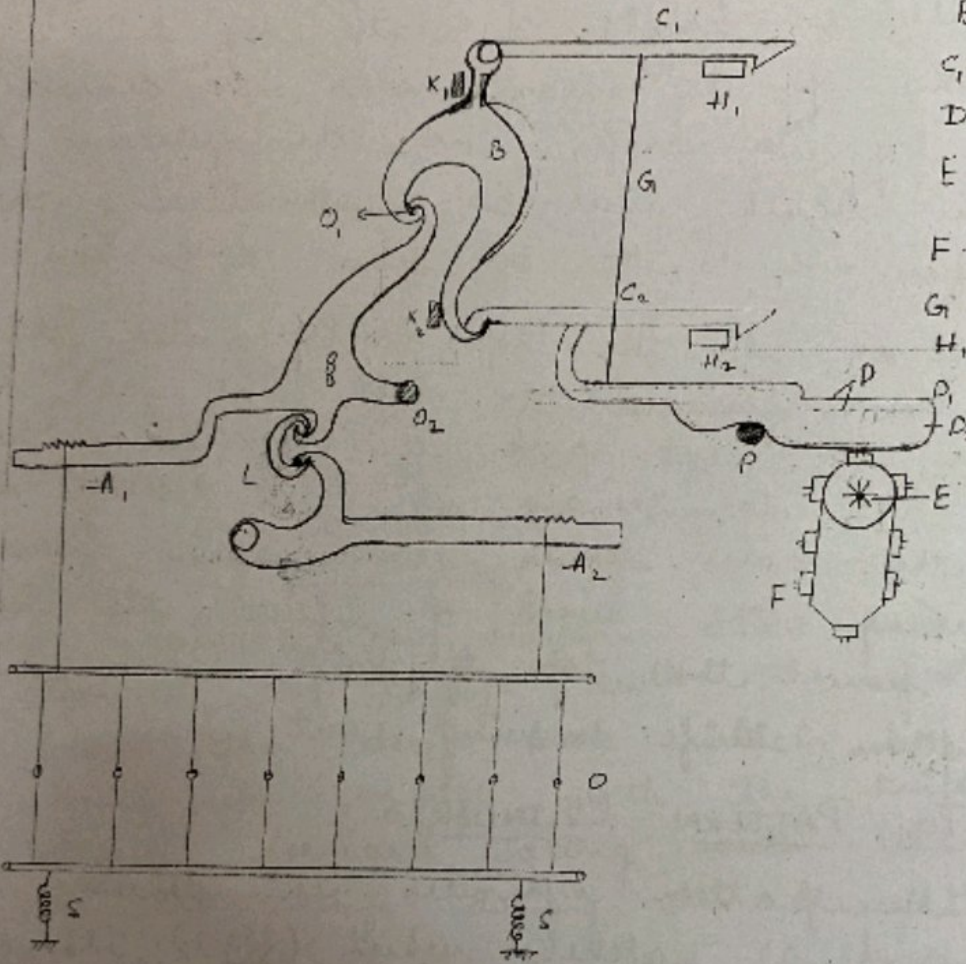
up for two or more consecutive picks, both the top and bottom draw hooks c_1 and c_2 belonging to that heald are lowered through the action of pegs provided on the two rows of holes corresponding to that particular heald. < This will be explained later by line diagra. However, one of the draw hooks is drawn forward by its knife, and the fulcrum for the same baulk lever is automatically changes either from K_1 to K_2 or from K_2 to K_1.

For ex: if the top knife pulls the baulk lever forward to lift the jack lever and for the next pick if the same heald frame has to remain up, the bottom knife pulls the same baulk lever again forward, transferring the work of lifting the heald frame from the top ~~of~~ knife moving in, to the bottom knife moving out.

<u>DRIVE TO PATTERN CYLINDER</u> :→

The pattern cylinder is driven by a pawl and a ratchet wheel (fig 2). The pawl is connected to the lower end of the draw bar lever and it engages with a ratchet wheel B on the pattern cylinder C. During the forward movement of the lower draw knife, that is, every second pick, the pawl A pushes the ratchet wheel B one tooth, and the cylinder C moves one eighth of a turn. Then the cylinder is steadied by a spring acting finger N fulcrumed at D, resting on a flat sided star wheel. This star wheel is also mounted on the pattern cylinder shaft on the opposite end the ratchet wheel.

DOUBLE LIFT DOUBLE JACK (CLIMAX):→

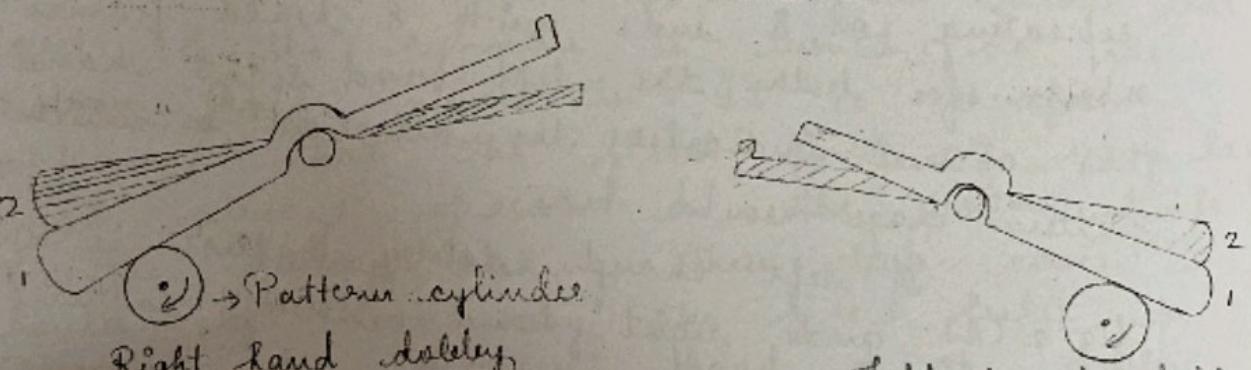


A - Jack
B - Baulk lever
C1 C2 - Draw hooks
D - Feelers
E - wooden pattern cylinder
F - Pattern chain
G - Needle
H1, H2 - Draw knives
K1, K2 - Stop bars
L - C Link
O - Heald frame
S - Reversing spring
A1 - Outer jack
A2 - Inner jack
O1, O2 - Fulcrums

The disadvantage of a single Jack Keighley dobby is the difficulty of getting a straight lift to the heald shafts. Various methods were used to prevent the shafts from swinging on single jack dobbies, such as passing the shaft cords over spaced rollers, using cords from parallel bars, and passing the shaft cords through holes in a pair of angle iron bolted to the top frame of the loom but they were not successful in practice. The problem was solved with the introduction of a second jack.

The climax double jack dobby combines jacks by means of a single short link known as 'C' link. As shown in fig. the outer jack fulcrumed at O is controlled directly by the bauk lever B as with the single jack keighley dobby. The short link L couples the outer jack A_2, fulcrumed at O_2, and both the jacks are lifted ~~through~~ together without the aid of either teeth or streamers.

ARRANGEMENT OF FEELERS :-

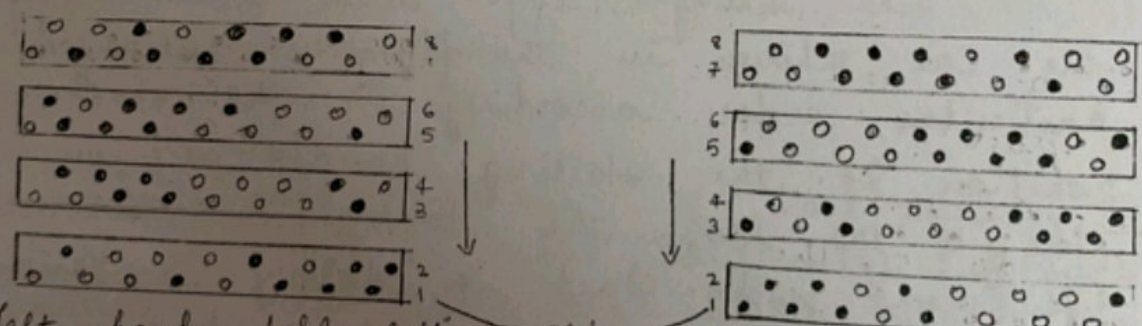


Right hand dobby

Left hand dobby

The straight edge and curve edge feelers are as shown in the fig. are arranged in a particular order according to the starting handle position. If the starting handle is on the right side of the loom, the dobby is mounted on the left hand side. Such a dobby is known "RIGHT HAND DOBBY". Conversely, if the starting handle is mount on the left hand side and dobby is mount on the right hand side, the dobby is called a "LEFT HAND DOBBY". Therefore the terms right hand and left hand dobbies refer to the "hand" of the loom and not on the position of the dobby on the loom. The first ~~refer~~ refer to the right hand dob is a curve edge and operates the bottom row of the draw hooks and pattern cylinder rotates in a clockwise direction. In the case of left hand dobby, the first feeler is a stright end operating the top row of hooks through the needles and the cylinder rotates in an anti clockwise direction. The idea of arranging the feelers in this order is to simplify the pegging of lage for a particular lifting plan. The first row of holes in the lage should represent the first pick in each case. In fig(2) the pegging plan for a fancy twill repeating on 8 ends with 8 heald frames is shown for both the left and right hand dobbies. The arrows indicates the direction in which the pattern lags would turn.

A left hand dobley lattice is shown in fig 2 (a) and right hand dobley lattice in fig 2 (b).



Left hand dobley lattice (A) — Pick — Right hand dobley lattice (B)

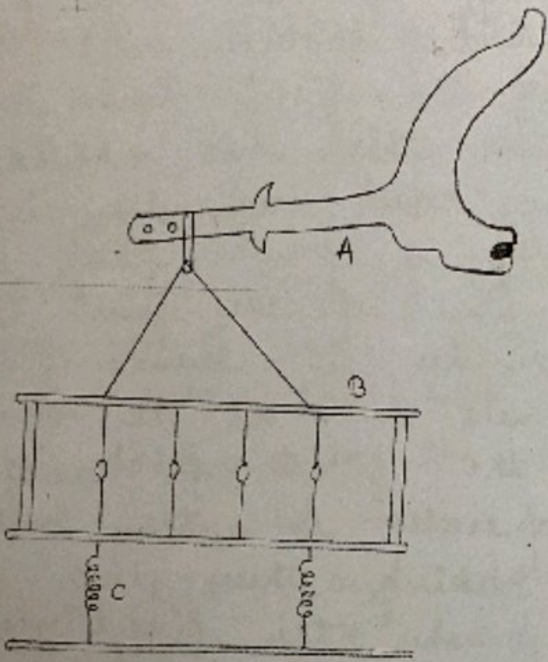
FIG A and B. DESIGN AND PEGGING PLANS TO LEFT HAND AND RIGHT HAND DOBBIES :→

However in each case the pegging plan on the point paper is read from the left to right and first pick starts at the bottom of the lags. A close study of the lags meant for right and left hand dobbies, will show that the first hole of the first row is at diff positions. Along with this, one should understan that the pattern card cylinder is turned in both cases by a pawl that is fixed to the lower arm of the front draw bar lever, & the cylinder is turned as the bottom knife moves in. It is therefore apparent that the first pick of any las must always operate on the bottom knife of the dobby. Taking these two cases it should be clear why the first feeler is different for different hand of the dobby. Fig 2 (a) & (b) shows the direction of movement of lags and the position of the first hole of the first row of holes corresponding to the first pick for each hand of dobby.

HEALD REVERSING MOTION :→

Since the negative dobbies can control the movement of the heald frame in one direction a heald reversing motion is necessary. Most of negative dobbies are designed to raise the heald frame.

The simplest form of reversing motion shown in fig(1) has two coiled springs for each heald frame attached ~~to~~ at the bottom. The main disadvantage of this system is tha when the heald frame is raised, ~~this~~ spring stretches thus adding strain on the lifting mechanism. The other disadvantage is that the heald frame will vibrate in case the spring position is not correct or very light springs are used or the elasticity of the springs is reduced due to constant oscillating movement.



A - Single Jack
B - Heald frame
C - Spring

An improved heald reversing motion is shown in fig (2) gives less tension on a raised heald than when the frame is down. The mechanism consists of two stands M which are mounted on a rail beneath the heald frames. At the top of the stand there is a tumbler lever N fulcrumed at O. It is held against a check pin P by springs. The lower end of the tumbler lever is connected to the heald frame by means of a spring. When the heald frame is raised the point of connection for spring passes the centre of so the stress is transferred to the fulcrumed pin and there is less tension on the heald frame. The max. spring tension is exerted on the heald frame when the point of connection is before the check pin P, that is, the heald is down.

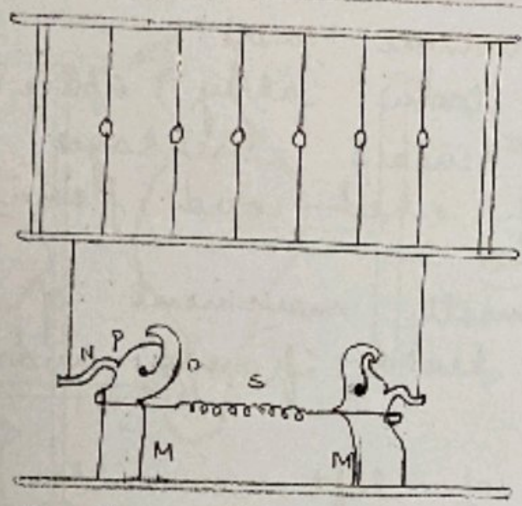


Fig (2) Heald Reversing Motion

Developments in the last few years has shown a constant increase of the weft insertion performance of weaving machines since the lifting of the shafts is carried out by a motion following the form of a cam and increase in shaft mainly requires more force as shown in fig (2). So a down pull system with diminishing traction, in the upper shed is not always sufficient. <loosen of traction organs etc>. To overcome this difficulty, staubli has developed spring und motions with a constant down pulling force in order to allow for the increased speed of the shafts.

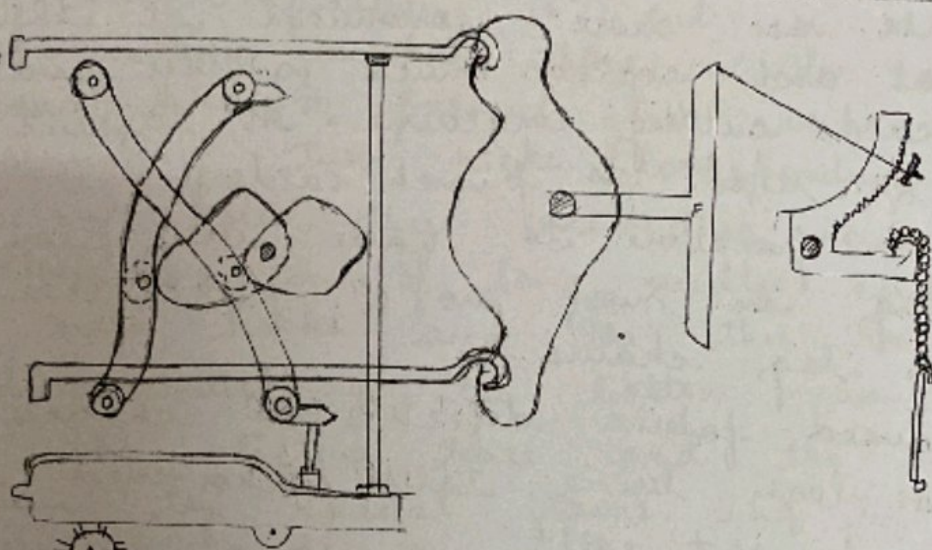
CAM DOBBY :->.

In the case of modern dobbies the knives are actuated by means of cams mounted on a shaft. The T- lever and the connecting rod to the bottom shaft sweep is totally discarded. The cams are driven by a chain from the crank shaft. With the design of cam shape, a dwell can be provided as obtained in case of tappet shedding

The advantages are:→

- Clearer loom alley space.
- Reduced warp breakages because of smaller depth of shed and provision of dwell peri[od] of healds.
- Very smooth movement of the healds, thus protecting heald frames and heald wires from damage.
- Amount of lift can be raised or reduced to suit a particular type of warp.
- The cams can be designed to give the required dwell period, for 60°, 90° or 120° of cran[k] shaft revolution according to loom width, spee[d] of operation and type of fabric, which in tur[n] gives other advantages like clearer (packas) passa[ge] for the shuttle flight, economy in power due to reduction in picking force and a corresponding reduction in wear & tear of the picking parts.

A simple line diagram shown in fig illustrates the actuating of the knives by cams. The bowls on the knife levers are kept always in contact with the cams, by special springs. The knives are only pushed by the cams and the returning is carried out by springs. Therefore these cams can be considered as negative in action. The selection of hooks is the same as per the Keighley dobby with the T-lever drive or needles of paper card dobby. The pattern cylinder is driven by a different arrangement.



DOBBY WITH PAPER PATTERN :→

In paper pattern, dobby the useful chain of wooden lags is replaced by a plastic or paper roll. Holes are punched in the paper corresponding to the pegs in the lag; that means, a hole in the paper makes the heald frame raise in a blank keeps it down through a mechanism.

COMPARISION BETWEEN LAGS (WOODEN) AND PAPER / SYNTHETIC CORDS :→

COMPARISION	WOODEN LAGS	PAPER / SYNTHETIC CORDS
Number of picks / min	72	333
Length of the pattern for 100 picks	1·39 m	0·3 m
Weight of pattern for 100 picks	2·3 kg	0·05 kg
Time required for making up pattern for two picks	1·1 hr	0·5 hr

Other advantage of the paper / synthetic cords over wooden lags are:

(i) Pattern (cylinder) cards of paper or synthet materials are more economical as they can be cut and copied much quicker and easier on card cutting machine. At present compu[ters] can be used to punch cards.

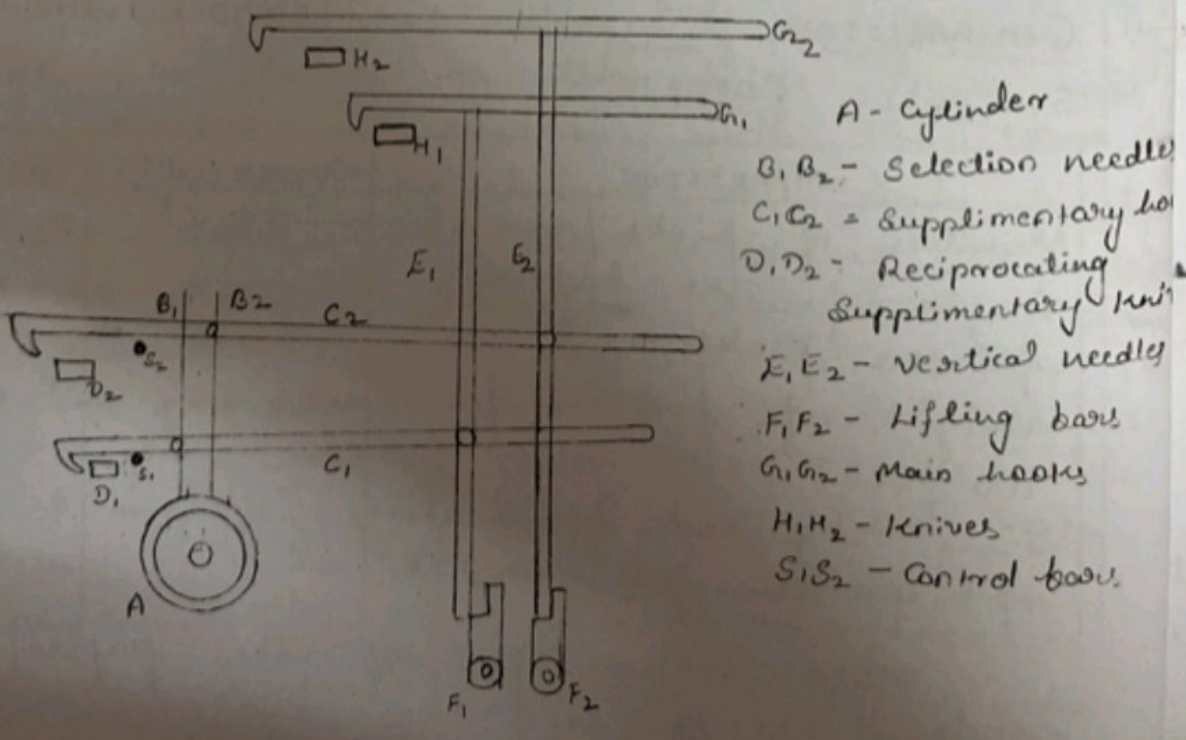
(ii) It is possible to have very long desig[ns] repeating on more no. of picks than with wooden lag chains.

(iii) Reduced fabric defects as chances of wooden lags being taller / shortened due to wear do not exist.

(iv) The punched paper patterns can be stor[ed] in a small area, if required again for the future use.

The principal of the hook selection mechanism used on paper dobby is outlined in simplified form in the fig(i)

Fig(i) Dobby with Paper Pattern.



The paper pattern is cut on a seperate card cutting machine. The cylinder rotates every second pick to present two rows of holes representing two picks. Corresponding to these rows of holes, there are two rows of selection needles, one row of long needles controlling to top main hooks and the other row of short needles controlling the bottom main hooks.

The lifting bars and the knives are driven by special cams. The lifting bars move up and down to lift or lower the main hooks. The movement of the bar is restricted to the time taken by the knife to pass under the hooks.

As soon as the knife moves in an the hooks are left free, the lifting bar moves for the next selecting, and moves up again before the knife moves out ~~the~~ with the lowered hooks, lifts the selecting needles at the time of the cylinder movement to prevent the needles damaging the pattern paper.

WORKING OF PAPER DOBBY :→

As soon as the cylinder A brings the paper pattern under the selecting needles B_1, B_2 the needles are lowered onto the the control rod S. A hole in the paper by the control rod S. A hole in the paper pattern allows the corresponding needles B_1 or B_2 drop into the cylinder hole and corresponding hooks C_1 or C_2 is lowered, than the reciprocating knife D_1 or D_2 will pull the corresponding vertical needle E_1 or E_2 out of the path of its lifting bar F_1 or F_2, with it result that the main hook G_1 or G_2 is lowered to engage its knife H_1 or H_2. A blank in the paper will allow the corresponding lifting bars F_1 or F_2 to lift main hook of the path of its knife. The lifting or lowering of the jacks and heald frames is similar to that of the ordinary do

POSITIVE DOBBY SHEDDING MOTION:→

As mentioned earlier, the characteristic the positive dobby is that the moveme of the heald frame in both directions foll the profile of a cam. The healds are usually pulled into the upper shed an pushed down into the lower shed. Unlik in negative dobby springs or spring unde motion are eliminated. The spring tensio together with the weight of the healds must be overcome by the negative dob in the lifting movement from the lower to the upper shed. It may be considera and put in unfavourable load on the dobby where great spring tension is necessary to pull down the healds.

The higher loom speeds specially wi for shuttleless weav m/cs., makes the moveme downwards more important, as the tension resist the changing of the healds fast enough from the upper shed to be in lower shed in time. It may happen tha due to insufficient force pulling downwa changing from upper to the lower shed. These difficulties can be overcome by using positive dobbies.

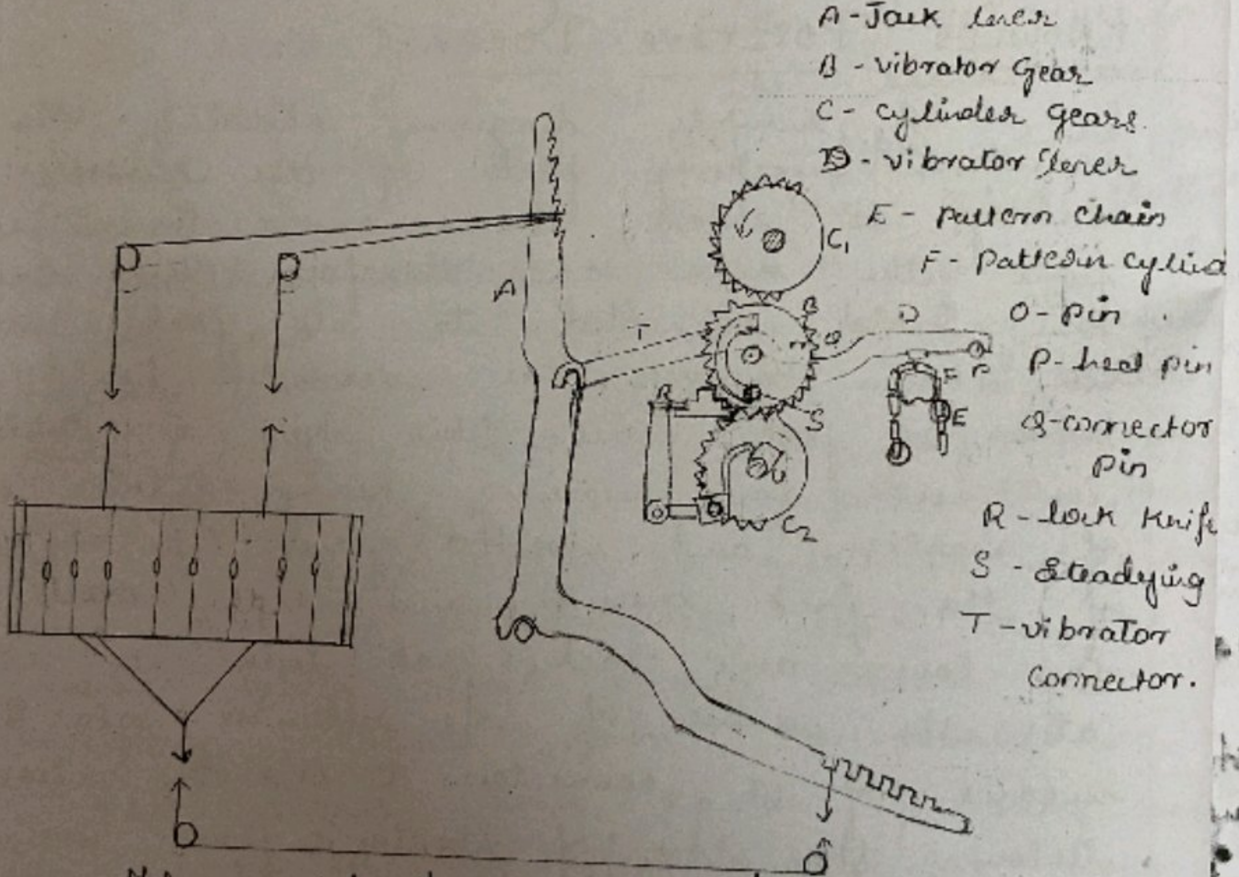
While choosing a positive dobby, it is no only the working speed which has to be considered, but the fabric to be produced. A a general rule, negative dobbies are for articles of light to low medium weight fabrics. High, medium and heavy fabrics and such fabrics requiring great warp tension. are woven with a positive dobby. In borderless case, preference is given to the positive dobby.

KNOWLE'S POSITIVE DOBBY :→

A simple diagram showing the essential working parts of the knowle's +ve dobby is shown. It is a sectional view from the side and therefore ~~(they)~~ only one heald connected to its jack lever is shown. However, there are 26 heald frame with 26 jack levers. This type of dobby is used for weaving heavy fabrics compos of woollen and worsted yarn. The top arm of the jack lever A and the bottom of the lower arm. Each jack lever is connect at the centre of a vibrator gear B by means of a connector T. Directly above & below the row of vibrator gears are two cylinder gears C_1 & C_2 that extend across the entire dobby.

The cylinder gears have teeth cut on only half of their circumferences, the other half being blank. They are driven in the direction of the arrows & rotate continuously making one revolution every pick. The vibrator gears B are made out of steel disc of 4.75 mm. thick with teeth cut (on) to match those on the cylinder gears. However the entire circumference of the vibrator gear is not covered with teeth. On one side a blank space of one teeth is left, and diamatically opposite side a blank space of 3 teeth is left.

KNOWLE'S POSITIVE DOBBY



The vibrator gear turns freely on pin O of the vibrator lever D which is fulcrumed on the heal pin P. This is vibrator lever D which is resting on the chain E which moves round on the pattern cylinders F.

The pattern chain consists of small rollers called rings and links called ~~sinkers~~. When the chain moves along the pattern (~~chain~~) cylinder either a riser or sinker according to the lifting plan, is brought ~~near~~ under the vibrator lever. There is on vibrator lever for every one jack lever. Therefore when the pattern chain is brought under the vibrator levers, there may be no. of risers & sinkers in the whole width of the pattern chain, corresponding to the no. of jack levers.

A riser lifts its corresponding vibrator lever and brings its vibrator gear in contact with the top cylinder gear which is constantly rotating when the teeth of the two cylinder mesh together, which is made possible because of a missing tooth on the vibrator gear, the cylinder gear C_1 turns the vibrator gear, about half revolution, that is, until the blank space of 3 teeth is brought on top. This moveme of the vibrator gear causes the connector pin Q of the vibrator connector T to move one (~~head~~) dead centre to the other, with the result the corresponding heald frame i lifted. The vibrator gear continues to ~~the~~ keep the heald frame raised as long as the rollers on the pattern chain, for each pick comes under the vibrator lever. As soon as a tube comes under it the vibrator lever will bring down its vibrator gear to in contact with the bottom cylinder gear C_2 and again vibrator gear turns half a revolution, this time lowering the heald frame.

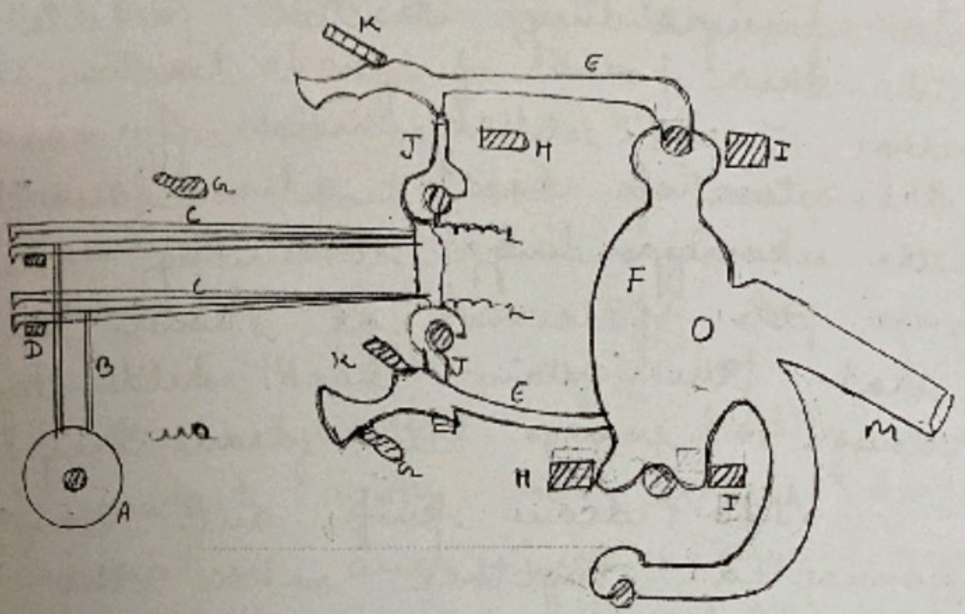
A lock knife R locks the vibrator le[ver] in position while the corresponding vibrator gears are in motion. This prevents the vibrator from being forced out of contact with cylinder gears. However the lock knife is moved from contact when the pattern chain is about to bring a new pattern but the vibrator lever by means of a cam fixed on the shaft of the bottom cylinder gear.

STAUBLI POSITIVE DOBBY:-

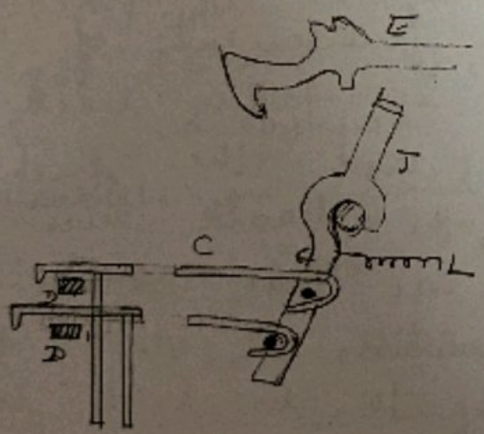
Staubli of Switzerland is one of the leading manufacturers of various types of dobb[ies]. Most of the unconventional weav[in]g m/cs like Sulzer-Ruti gripper and Somet rapier are fitted with staubli dobbies having cam dri[ve]. This new model has revolutionized the earli[er] concept of hooks, draw lever and feelers. Instead of these parts, cam has been introdu[ced] with the result of 220 cm. weaving machi[ne] can achieve a maximum speed of 360 rpm and weft-insertion rate of 1250 m/min.

The important development in the stau[bli] positive dobby is the introduction of push bars connecting to the draw (traverse) knives. During the backward movement of the draw knives when it returns after displacing a lowered hook, corresponding baulk lever is pushed back by the push bar against its stop bar. The staubli dobby is shown in the fig (1).

Fig 1 :→ STAUBLI POSITIVE DOBBY :→



A



A - Pattern cylinder
B - Feeler needles
C - Traction needles
D - Traction bar
E - Main hook
F - Baulk lever
G - Draw knife
H - Push bar
I - Stop bar
J - Returning lever
K - retaining knives
L - Traction Spring

WORKING OF STAUBLI POSITIVE DOBBY :→

A paper pattern is cut as per th lifting plan and placed on the cylind The cylinder rotates every second pick presenting two rows of holes representing two picks. Then the feeler needles are lowered by a control rod and the selection takesplace. The hole in the paper pattern drops the feeler needle down and its corresponding traction needle falls down in the path of the traction bar. Then the traction bar moves forward pulling the traction needle also forward. This carries the corresponding returning lever till bar on the fulcrum as shown in fig (a) so that the main hook held by it, fall down to engage its draw knife.

The draw knife and the push bar are connected together when the draw knife carries the lowered hook forward the push bar also moves forward. This will ~~engage~~ enable the corresponding heald frame, to lift. During the backward movement of the draw knife the hook is taken back to its original position and the push bar pushes the end of the baulk lever against its stop bar. As soon as the draw knife reaches the normal position, it tilts ~~the~~ to raise the lowered hook to be held by its returning lever. Then the retaining knife will engage the upper hook until the next selection takesplace. Two extra feeler needles are provided for pick finding.

CROSS BORDER DOBBY :->

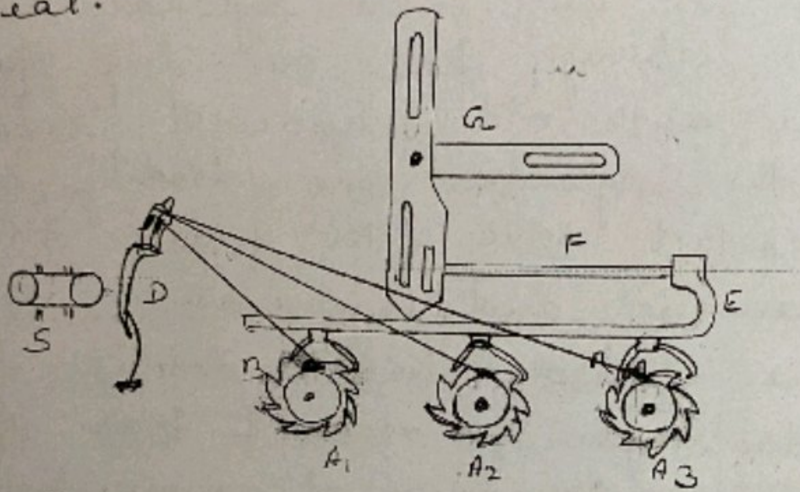
Cross Border Dobby is used when two or three different weaves are required to be woven for the same no. of heald frames and drawing order. For ex: in towel heading or bordered hand-kerchiefs or serviettes two different weaves are required. One for body and other for the cross border. Such an arrangement is possible by providing additional one, two or even three pattern cylinders and changing them automatically. When one pattern cylinder is in operation the others are put out of action. In each case there is an extra cylinder used for making the change from one lag of cylinder to another with older types of cross border dobbies; the cylinders are bodily moved out of contact with the feelers to make them operative and inoperative respectively. This types of cross border dobbies have the disadvantage of wear & tear of moving part. In recent types of cross border dobby e.g:→ Climax or Yamada, the moving shaft is dispensed with & the lattice barrel works in fixed bearings.

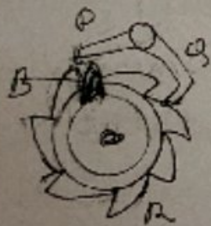
CLIMAX CROSS BORDER DOBBY :→

The climax cross border dobby illustrated in figure changes the pattern cylinders automatically when the repeat of a particular pattern is given a part turn, enabling the lattice pegs clear of the feelers. At the same time the other cylinder is brought into action automatically by a selection cylinder.

In the illustration three pattern cylinders A_1, A_2, A_3 and one selection cylinder S are shown. Each cylinder is operated by a pushed pawl P and a pulling catch Q.

Both of them are mounted on the same stud. The selection cylinder is turned by the action of the last jack of the dobby while the jack of the dobby itself is put into into action by a peg on the working pattern lattice after completing the required repeat.





$A_1, A_2\ A_3$- Pattern cylinders

B- Cam

D - Finger lever

P- Pushing pawl

Q- Pulling catch

R- Ratchet wheel

S- Selection cylinder

G→T- lever

Each pattern cylinder is coupled with a cam B which is connected by a link to finger lever D. There are three finger levers corresponding to three pattern cylinder. These finger levers are operated by a selection pattern mounted on selection cylinder S. A blank in selection lag lowers the cam B & puts its cylinder out of action by lifting the pushing pawl P clear of the ratchet wheel. When the pushing pawl P is lifted, the pulling catch Q drops into gear with the ratchet wheel R & turns the cylinder through half a tooth movement making the pegs inoperative. The oscillating motion of the pushing pawls & pulling catches is derived from the lear E which is connected to the rod F and T-lever G.

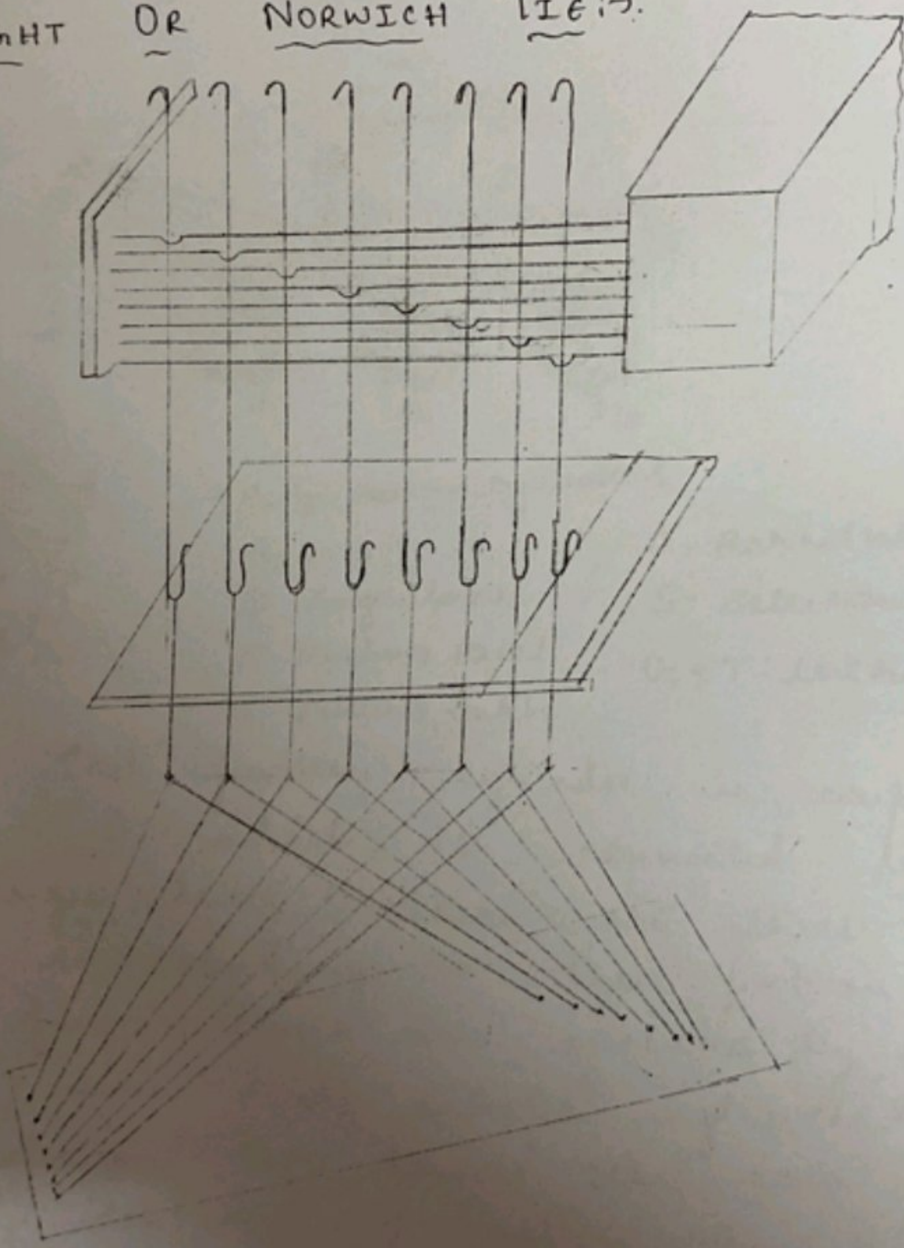
——— × ——— × ———.

JACQUARD SHEDDING.

HARNESS TIES:

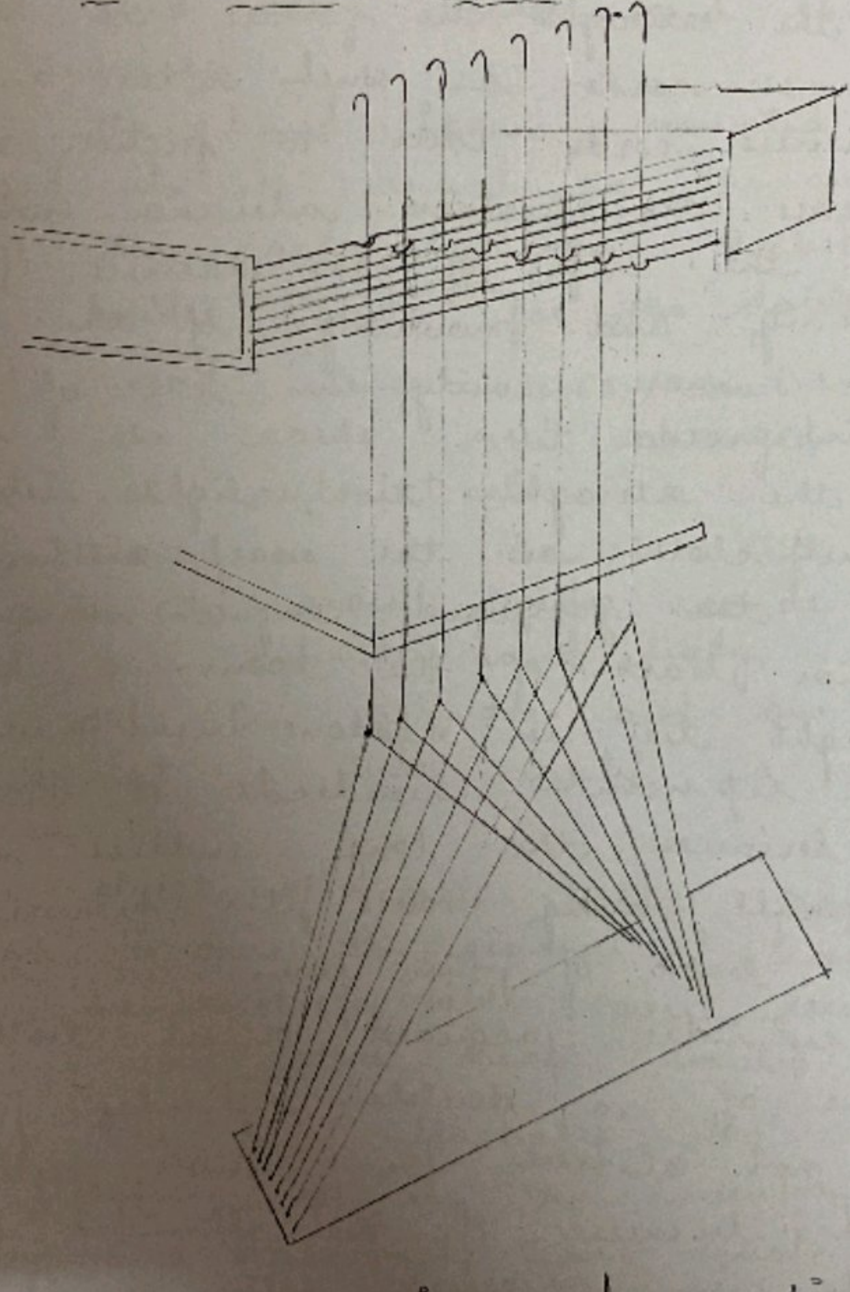
Harness tie indicates the position of the jacquard engine above the loom. The jacquard cylinder may be parallel to the reed or it may be parallel to the warp ends. There are three two main systems in common use for the harness ties.

STRIAGHT OR NORWICH TIE:->.



When jacquard machine is placed over the loom in such a position that the cylinder is either at the back of the loom over the warp yarn or at the front above the head of the weaver, the harness is said to have a straight or norwich tie which is shown in the machine are parallel with the long rows of holes in the comber board.

CROSS OR LONDON SYSTEM :→



when the jacquard machine is so placed above the loom that the cylinder is either to the right or left side of the loom, the harness is said to have a cross

London tie which is shown in the above (in the last page). The long rows of hooks in the machine are right angles to the lo rows of holes in the comber board.

RELATIVE MERITS AND DEMERITS OF TWO SYSTE

1) In the straight tie there is no crossi of harness cords as such wear and tear, the harness cords due to friction is less.

Cross tie produces abrasion (~~width~~) which reduces the life of the harness.

2) Repairing and mounting of the harness c be done more easily in case of straight than in cross tie.

3) In the striaght tie, light is obstruct over the cloth or the warp sheet dependin whether the jacquard engine is at the front or back of the loom.

4) Striaght tie is seldom used when a repeat represents hundreds or thousands o picks because the long endless chain of cards will hang over the weaver's head at the back of the loom in case of single cylinder jacquard or at both places in case of a double cylinder jacquard. It is not suitable for double cylinder jacquard because of the limited space available in weaver's alley.

5) In case of cross tie the weaver wil have sufficient free space in front or back of the loom and both the chains of cards can be watched from the front of the loom in case of double cylinder jacq-

CROSS BORDER JACQUARD:→

CHARACTERISTICS:→

1) The no. of cards, however may be saved by lacing two sets seperately. one set of cards for the cross border and another set for the border and body weave, and changing them when required.

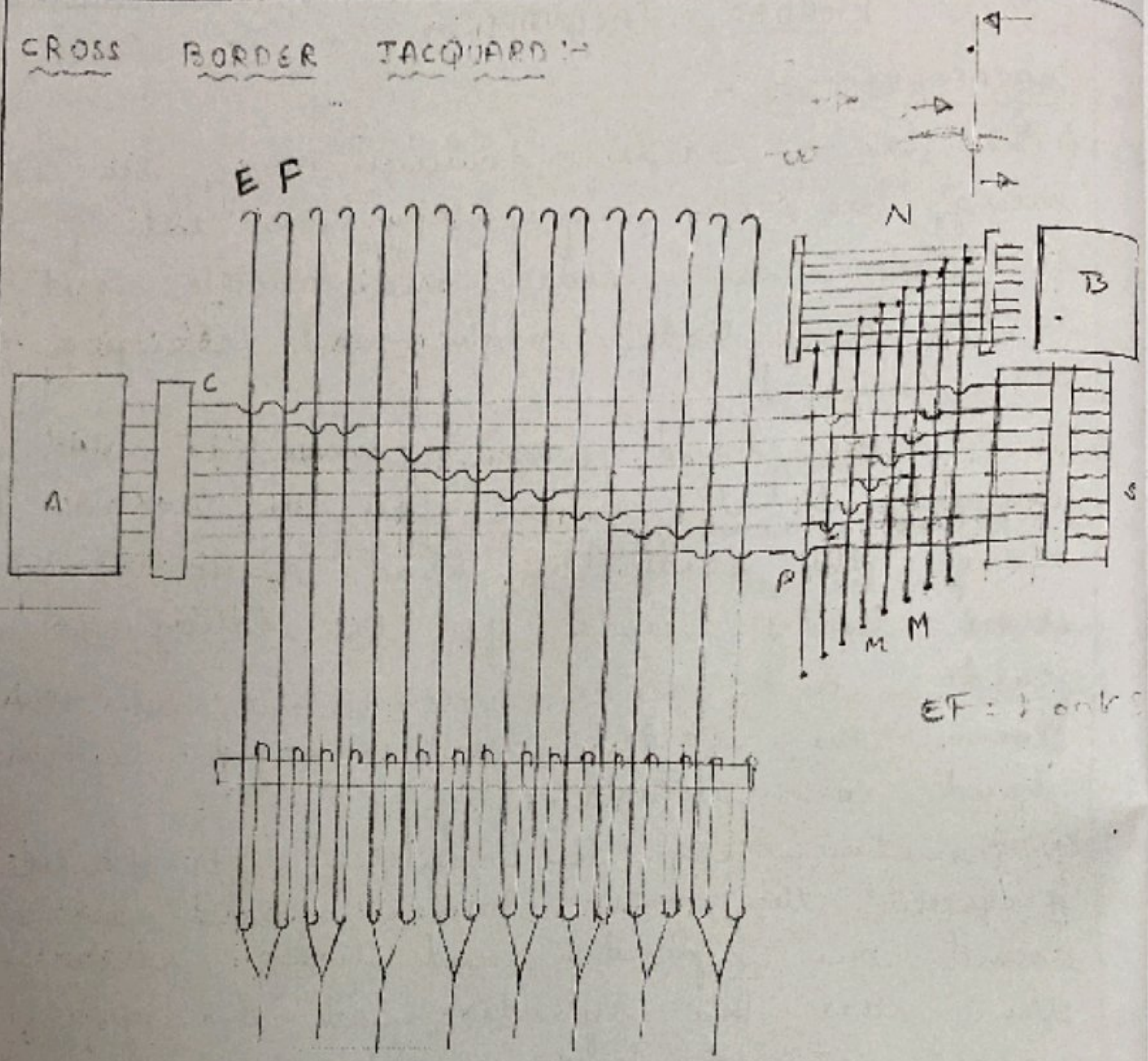
2). On the hand looms mounted with a jacquard, it is usual for the weaver to change the cards by hand, substituting the cross border cards for the dobby or middle cards and vice-versa, but on the power loom the cards are changed either by hand or automatically.

3). Sometimes on a double lift double cylinder jacquard, the cross border cards are passed round one cylinder and body cards round the other. One cylinder and one griffe are worked at a time until a change is required.

4) The object of cross border jacquards is therefore to save the expense of cards in sarees, handkerchiefs, table covers, bed sheets, towels, curtains. and other cross border fabrics.

The fig illustrates the working of cross border JQ is the invention of M/s crossley and Davanport. The machine is double lift and two cylinders & a duplicate set of needles. Both set of needles moves the same hooks, but one cylinder is always stationary. This is also suitable for high speed looms.

CROSS BORDER JACQUARD :-



The cross border cards are put on cylinder B and the body cards on cylinder A, when the cylinder 'A' presses back a needle, say the top needle C, it will press back the pair of hooks EF, as in an ordinary DLSC JQ. And as long as this cylinder is worked every pick, the m/c is as good as DLSC JQ. When this cylinder is stopped the cylinder B starts working and have exactly the same effect on the ends as those on cylinder 'A'. As the top needle in the set of needle press back, it will force backward the pair of hooks EF, exactly as operating needle 'C' by the other cylinder did. Only one spring to 'S' is used, as a upright wires MM passes through the loops or bends in the long needle 'C' and the small iron bars 'HH' acts as fulcrum for the wires 'MM'. The tops of these wires are fastened to the short needles 'N', & thus when the needle N is pressed back, it move needle 'C' in the opposite direction and operates the hook EF.

HARNESS TIE (DESIGN TIE).

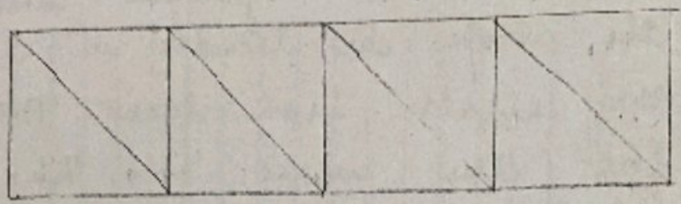
The harness cords of the JQ need not necessarily pass through the holes of the comber board in the same order as they are connected to the hooks. In tieing of harness several orders of drafting the cords are employed for the purpose of special forms of designs to the economically woven.

The different harness ties are:

1. Striaght tie-up
2. Centre or pointed tie.
3. Border tie.

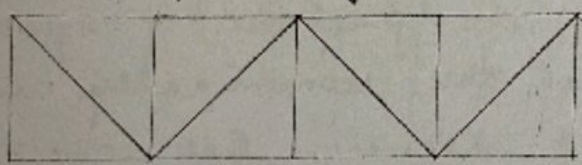
①. STRIAGHT TIE :→

This tie is used to produce a fabric containing only one repeat of the design in the full width of the fabric. Only one harne cord is attached to one neck cord or to a hook and there must be as many hooks as there are threads in the width of the fabric. Ex: If there are 400 hooks in the JI then the total ends in the width of the fabric will be 400 only. This is therefore no extensively used in it either suitable for narrow width fabrics or for portraits and f a copy of a painting.



POINTED TIE :→

This type of tie is suitably used w a design is symmetrical, if turned over i central line. Second repeat is a mirror im of the first. This tends to give the impres of doubling the size of the repeat, but the double repeat must be symmetrical about its central line. This type of tie is largely used for silk ribbons, curtains, serviettes tray cloth, upholstery and carpets.



BORDER TIE :→

A border tie is the same as the name suggests, a tie which is mainly used for bordered fabrics like handkerchief or tabl cloth. The central design may be a repeating or central (~~time~~) tie and any appropriate number of hooks may be assigned for the border and the body design of the fabric.

CASTING OUT :→

In tappet and dobby shedding, the w ends/cm can be varied at will with JQ shedding, the max. no. of ends/cm is determin by the harness. There is no possibility of war a fabric with more ends/cm than the harness has. It is possible to weave a fabric with fewer ends/cm by casting-out. This consists of in leaving selected hooks and harness cords they control idle suppose, for instance, that designed for weaving a fabric with 32 ends/cm The size of the repeat will be $\frac{400}{32} = 12.5$ cm. [Assume that 400 hook JQ].

If we wish to weave a fabric with out 24 ends/cm, we can do this by leaving 4th row of mails empty. We shall then have 300 end in a repeat of 12.5 cm. In casting out, it is desirable to omit whole rows of hooks, if possible in order to simplify designing and card cutting. There are however, occasions when it would be more convenient to leave out every fourth end instead of every fourth row. There can be no hard and fast rules about casting out.

CARD CUTTING :-

First a design is drawn on a plain paper and then repeated a sufficient no. of times vertically and horizontally to see the overall and general effect of the repeating pattern. The design is then transferred and enlarged on a suitable graph paper. Every square of the graph through which the outline of the figure passes, is completed or left empty using a (~~direction~~) discretion. The figs are then painted in some transparent colour to indicate the warp or weft. Before the card cutting, the lift of the threads required for the design has to be decided. The specific instruction for card cutting are mentioned on the design paper for information of the card cutter.

Before starting the card cutting it is necessary to divide the graph paper by the verticle lines into a no. of hooks in a short row. The bar on design paper is a guide to card cutter. This with a 8 hooks in the short row of the JQ, the design paper shall be marked with heavy lines after every 8 small squares horizontally. This is essential because the working of all hooks in each short row is read at a time for punching card. Thus, in a 400 m/c with 8 hooks in each short row, 50 operations of punching are required to transfer the working of 400 ends from the graph paper to the pattern card.

In ordinary JQ each card represent only one pick of the design. As many cards will be required to be cut as there are picks in a repeat of a design. Thus if a repeat completed on 300 picks then it is essential to cut 300 cards. It is necessary to use a good quality of cards as they have to resist the strain and wear on account of their constant movement and the pressure of the needles.

CARD CUTTING MACHINE :->.

The most commonly type of manually operated card cutting machine used in the industry is known as piano card cutting machine. Fig 1 shows the line diagram of the machine. Fig 2 (a) & (b) shows front view and plan of the machine respectively. In the head there are 12 keys numbered from 1 to 12. when these keys pressed in with the finger tips. they come directly over verticle punches which are also 12 in number There is a key 13 which when pushed in, can lock a bigger diameter punch known as a peg hole punch. when the pressure of the finger is released the springs return the keys to their original positions.

The entire head is supported by two upright rods J & J, shown in figure. These rods together with the head are lifted or lowered by means of levers that are controlled by the feet of the card cutter connected to the foot lever A is a rod C that connec the lever D, attached to rod E which inturn is connected to the lever F. The lever F & the foot lever B are linked by a rod 'G'. The lever F extends to the front of the machine and a casting which is bolted to a cross piece 'H' is attached to the lever 'F'. The cross piece is secured to the rods J - J, . By pressing down a foot lever B the crosspiece H together with the rods J and the head 'K' is lowered to with the lowering of B the foot lever B A is raised through the lever connections as shown in fig On the other hand, when the foot lever A is pressed down the inner end of the lever F will be raised thus raising the crosspiec H together with the head. This also raised the other foot lever into position to be pressed down for the next cutting operati[on]

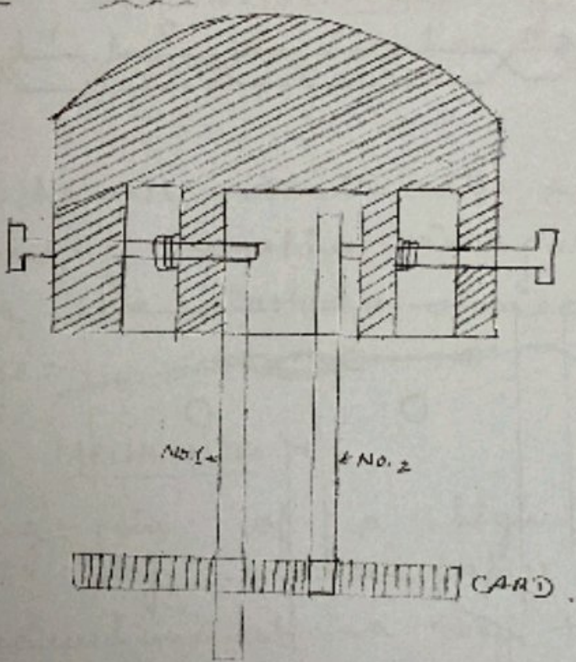
OPERATION OF CARD CUTTING :→

The card is inserted and is b[rought] into its place by pressing a lever L which lifts a catch to insert the card for securing it firmly in its position. The c[ard] cutter with his finger tips presses in the keys that lock the punches for the holes to be cut as per design and the instruct[ions] given to him. With the punch locked by the keys, the card cutter presses the lever which brings down the head together with the punches so that the punches that are locked by the keys penetrate the card a[s] shown in fig. If the punch is not locke[d] by its respective key the card ~~(cutting)~~ coming to contact with it, remains uncut. Keys 1 & 2 are controlled by the thumb of right hand and keys 3, 4, 5, 6 by the fingers of the right hand. Keys 7, 8, 9 & 10 by the fingers of the left hand and keys 11 & 12 by the thumb of the left hand. Peg h[ole] key is controlled by thumb of the right h[and].

Before card cutting is to be started it [is] necessary, to note the position of the hook in the jacquard and cutting procedure correspon[ds] to the first hook and the design transferred on the point paper.

The design paper or the point pape[r] with the design marked on it is placed o[n] the board should be then moved until the first horizontal line to be read from the design paper is below the guide rule. Depending upon the instructions given to the card cutter, either for the blanks or filled in squares, a hol should be cut in the card. A hole cut in the card means a corresponding thread will be lifted.

PIANO CARD CUTTER :



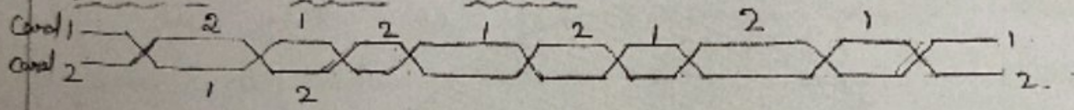
CARD LACING :→

The next operation after the cards are cut, the lacing of the cards to form a endless card chain. The card lacing operat is usually done by hand in small firms but big firms use automatic lacing m/c.

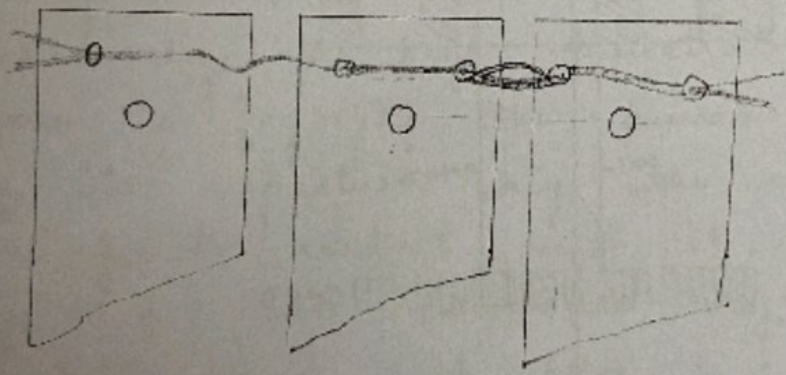
HAND LACING :→

A wooden lacing frame consisting of 2 long narrow supports for the cards is used to place 30-50 cards, at the time for lacing. The wooden lacing frame is studded with small meta or wooden pegs representing the pegs of th cylinder of the JQ. The pegs are ~~the~~ equidi and coincide with the pitch of the peg hol in the card cylinder. The cards are placed in a serial order in that frame, the p holes of the card fitting on the pegs of t lacing frame. A needle, threaded with a la twine, is ~~[illegible]~~ used to lace the cards.

LACING MINUS CARDS :-



CARDS LACED :



AUTOMATIC LACED MACHINE :-

Machine lacing is resorted to for two reasons.

(i) for speedier operation.

(ii) for lacing the cards with uniform tension on the cards so that cards can fit on and rotate round the cylinder in a smooth manner. In India no automatic laci machines are used and hence the despriptio of such machine is omitted.

HIGH SPEED JACQUARDS:→

High Speed Jacquards are suited for use in high speed shuttleless weaving machines an is recommended also for double width weaving. The knife frames are actuated by bilateral baulk levers in combination with a connectin arm with cams and large surface heavy duty ball bearings. All other pivots also have ball or needle bearings. The knife fram are guided by low friction sliders.

HARNESS :

The harness contributes to the efficiency of a weaving machine. Downpull is effected either by a ~~etto~~ elastomer elements or stainless steel springs.

READING-IN MECHANISM:→

Reading in of a high speed JQ is carried out by endless paper in needol pitch. It is concived in such a way that it meets all the requirements for rapid function and low maintainence. The reading-in needles are stiffed fitted with pressure springs, the needle guide is to remove for clearing.

Electronically controlled JQ are also developments by Staubli, Bonas etc. The features of the multi-task control and its highly diverse possibilities are:

(1) Reading patterns, weaves ~~~~ or programs from an appropriately formatted floppy to the hard disc or vice-versa.

(2) combining and creating of basic pattern

weave and program data for a new weaving program.

(3) Weaving of patterns acc. to a desired programmable production program.

(4) Modifying and correcting such as inser changing and deleting of cross points.

Outstanding features of computer control

(1) Keyboard for selecting and editing different functions and programs.

(2) Screen for displaying all stored data plus facility for displaying selected enlarged area of pattern.

(3) Hard disc for storing program data specif to machine and no. of picks with a maximu of 2,30,000 picks with 1344 hooks or 1,15,000 picks with 2688 hooks on Staubli 6x860 JQ m

(4) Floppy disc for loading hard disc. Each floppy can

SHUTTLELESS LOOMS.

INTRODUCTION :→

The conventional loom with fly shuttle has been receiving constant attention of textile engineers for over two centuries to reduce work (~~hand~~) load, achieve greater production & produce better quality cloth. With the start of 20th century bobbin changing looms were installed in weave rooms. Since then many mechanisms & new inventions have been applied to these bobbin changing looms and now the automatic looms are quite versatile & are available for weaving almost any type of fabric like jute fabrics, canvas, rayon and nylon tyre cord fabrics, industrial fabrics made from glass, asbestos, cotton and many varieties of synthetic yarns in addition to domestic cloths & dress goods. The technique of replacing a shuttle with almost empty pirn (~~cop~~) by another shuttle containing full pirn on shuttle changing looms could not compete commercial a pirn changing device as it required much more labour to feed weft supply to the loom magazine. Moreover, there are limitations and some of the designs require stopping the loom for a few seconds on each shuttle change. Bobbin loaders and loom winders have been invented and are being used in the advanced countries for last three decades which reduce workload of the worker appreciably and also improve the cloth quality by reducing the material handling <weft>. Of course, the bobbin loader is gradually becoming obsolete, mainly because it has only limited advantage over the ro magazine as compared with the loom winder

LIMITATIONS OF SHUTTLE LOOMS :→

1. Speed of shuttle :→

It is directly proportional to the lo speed. If one wants to increase the shut speed, there is no any other alternative than to increase the loom speed.

2. Power Requirement :→

Power required for picking is propor to the cube of loom speed. If one wants t increase the loom speed, the power required will increase three times for the same mass of the shuttle. The power to operate the shu & picking mechanism is almost 50% that i required by the whole loom.

3. Shuttle checking and retardation becomes more complex and difficult.

4. Shuttle is not controlled or constrain to its path positively. the addition of warp protectors and shuttle guards increases compl & the cost. Shock load imposed by mechanical fast reed warp protectors, also make it difficult to increase the speed loom.

5. No positive control over the flight of th shuttle and is a flying substance.

6. Greater amount of noise and vibration.

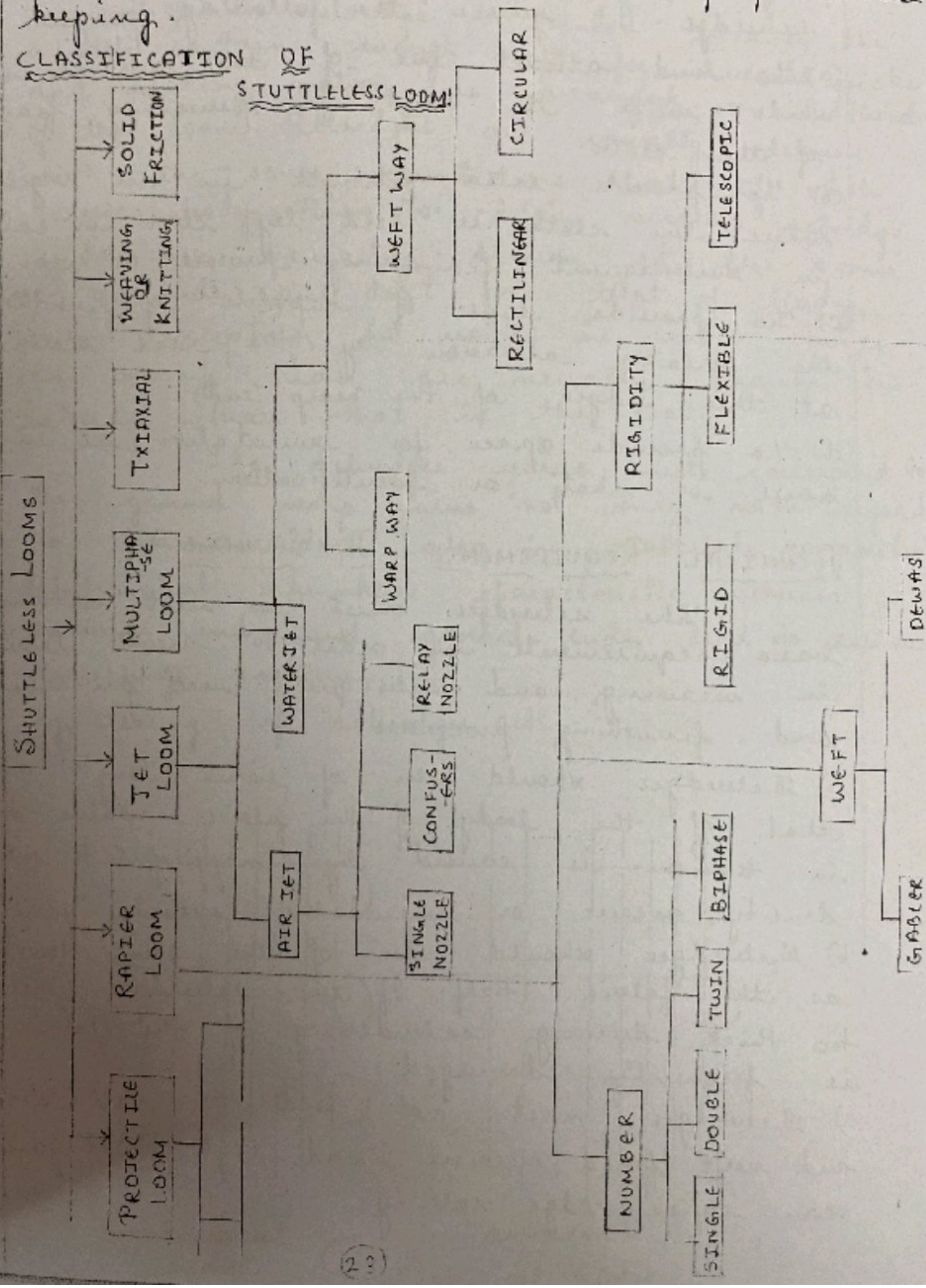
7. Requires additional preparatory department pirn winding.

8. No precision manufacturing with respect to metallurgy.

9. No synchronisation of motions.

10. No dwell of the sley.
11. Design complexity for pick & pick and pick at mill loom.
12. Unplanned layout leads to improper house keeping.

CLASSIFICATION OF STUTTLELESS LOOM!



SELVEDGE FORMATION :→

The warp way strip which forms the edge of a piece of cloth is known as selvedge. It serves the following purpose:

(a) To bind atleast one of the extreme end ends with the weft for preventing fraying of the cloth.

(b) To provide extra strength in the region where the cloth is held by clips or also in subsequent finishing process or use.

(c) To provide ends of capable of withstand the greater abrasion by the reed occurring at the edges of the warp end.

(d) To provide space for ornamentation as in saree or dhoti or identification.

TECHNICAL REQUIREMENTS OF SELVEDGE :→

The selvedges must to meet certain basic requirements in order to avoid trouble in weaving and subsequent wet processing and finishing processes:

a) Selvedges should be of same length as that of the body of the fabric. otherwise diff in tension is caused by inappropriate selved density, weave or unsuitable selvedge yarn.

b) Selvedges should be of the same thickness as the fabric itself. If the selvedges are too thick, during calendering of the fabric is frequently damaged.

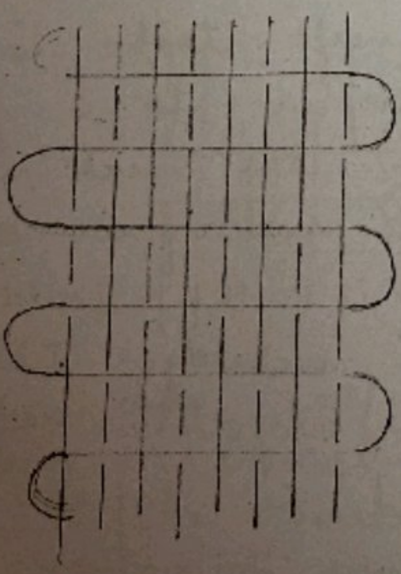
c) Selvedges must not tend to roll. warp and weft faced weaves and high twist yarns can cause edge rolling.

TYPES OF SELVEDGES :→

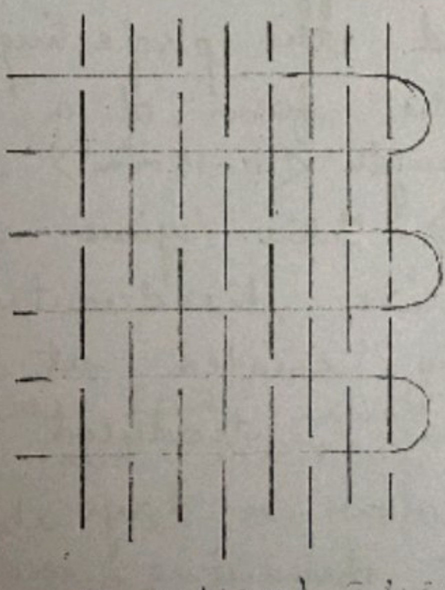
CONVENTIONAL SELVEDGE :→

On conventional looms true, i.e. conventional selvedge is formed because the shuttle contains enough weft for several picks and picking motion is arranged on both sid of the loom. Selvedges are usually drawn with the same count as that of with fabric body. Plain For plain weaves, selvedge ends are usually drawn at the same no. of ends per dent as that of body ends excepting in voiles in which twice as many ends are usually drawn in selvedge than that in the body.

The selvedges yarns must correspond to the ground warp yarns not only with regard to fineness but also in material compositio Differential shrinkage characteristic between selvedge end and ground ends lead to serious processing problems.
Eg: tearing of selvedges etc.



Conventional Selvedge



Conventional Sel... at Sides

5 48

Unconventional Selvedge :→

On unconventional weaving m/c there are unconventional selvedges atleast on one side. They are :→
- tucked in selvedges
- chain stitch
- leno selvedges
- Fused or melt selvedges
- Glued selvedges.

Tucked - In Selvedges :→

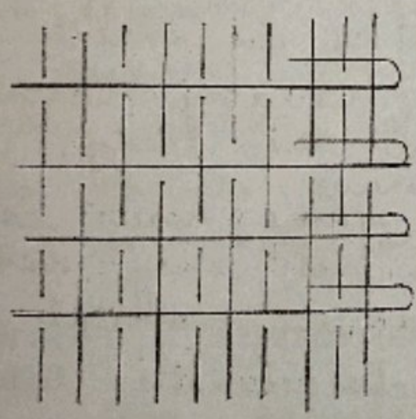


Fig (1)

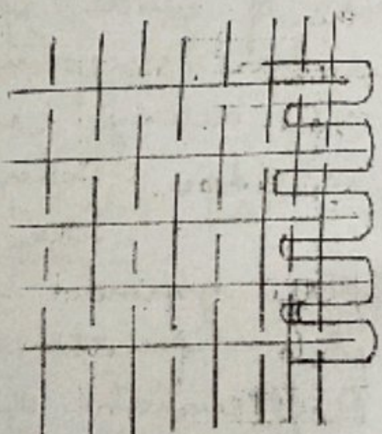


Fig (2)

Tucked selvedges can be formed two different methods. With most comm method the projecting weft tail is tucke in the form of a hairpin to a predeter -ed. length <10-15 mm> into the next weave s <fig 1>. This gives neat and firm selvedge but its disadvantage is the double weft density created at the selvedge. This type was introduced in projectile machine but now a days used in rapier and airjet weaving machines. Formation of th type of selvedge is by either mechanical

~~or~~ by means of a hooked nozzle or pneumatica by suction.

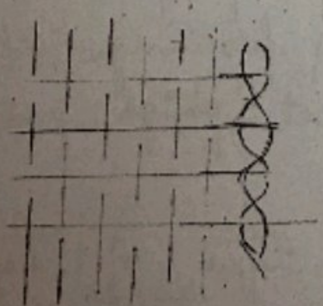
The second type of tucked-in selved is as shown in fig 2. It consists of tucking an additional fine thread into selvedge. This loop can be introduced by a needle after each or alternate picks.

LENO SELVEDGES :→.

Dummy selvedges are required atleast on the offside of the loom to hold the ends of the picks until they are separated from main selvedge by a cutter. Fabric with ~~with~~ which are leno selvedge have fringe ends less attractive than the tucked in selvedges. Leno selvedges are suitable for high speed weaving used on rapier, water jet and air jet looms.

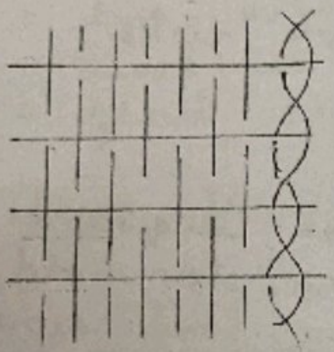
Leno selvedges are of two types half cross leno and full cross leno selvedges.

HALF CROSS LENO :



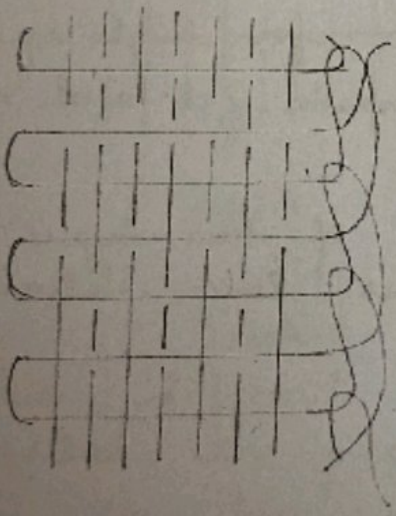
The half cross leno with two len threads alternating and crossing between two threads corresponds to the single leno. In this case two leno threads run in opposite direction round the standard end and thus bind each pick on both sides, the standard end. Half cross leno can be produced with needle harness.

FULL - CROSS LENO SELVEDGES :→



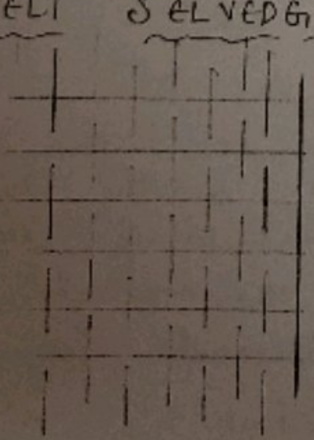
Full cross leno selvedge is made by twisting two spe ends, often called as lei ends, continuously together a inserting the pick between th This type of selvedge is refe to twisted selvedge.

CHAIN STITCH EDGES :→



Chain stitch edges are mostly produced on shuttle narrow fabric weaving mach in which the pick is ins by means of a needle. These machines run at a very speed and the mech for forming chain does n affect high prodn operation.

MELT SELVEDGES :→



This type of selvedge is al known as fused selvedge. The formation of this type selved requires outermost end of thermoplastic filament yarns.

Eg: Polyester, polyamide etc, with this method. the edge ends are plasticized by means of an incandescent pin or ultrasonics and stuck together to produce a firm neat edge which does not curl up. This type of selvedge can be used in all weaving machine. They also require dummy selvedges, so the wastages are high upto 2-4% depending upon the no. of ends and width of fabrics.

WEFT ACCUMULATORS:→

weft accumulator is a device which stores in advance of insertion, a length of weft in the form that allows it to be withdra at a high speed comparitively at a low tension.

weft accumulators are optional on rapier and projectile weaving machines to allow high rate of weft insertion. weft accumulators along weft measuring devices are essential on jet loom

ADVANTAGES OF USE OF WEFT ACCUMULATORS:→

a) reduction in the average tension during weft insertion.

b) fewer ~~be~~ weft breakages.

c). equalisation of yarn tension caused by the diminishing diameter of the weft supply package.

d). Yarn loops can no longer be formed from the supply package.

e). less weft & wastage.

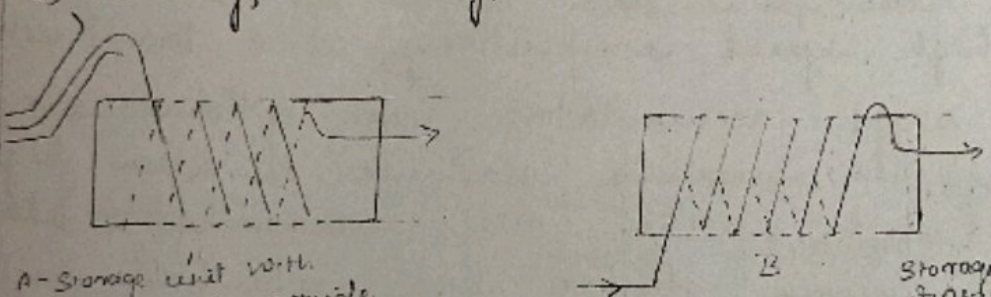
f). Increase in the efficiency of the weaving m

DISADVANTAGES OF USE OF YARN ACCUMULATORS ARE

a) abrasion of yarn surface due to guiding and tensioning mechanism.
b) longer stoppage time for mending a yarn breakage if the fault is between the supply package and the weft accumulator.

TYPES OF WEFT ACCUMULATORS:-

Basically there are two types of weft accumulators.
a) Rotating guide and stationary winding unit, majority of accumulators is of this type.
b) Rotating winding unit and stationary guides.



A - Storage unit with rotating yarn guide

B

Storage units with rotating winding u

In one version the thread transport is continuous. i.e. loops are running in the running direction of the thread. This yarn configuration calls for a special design of accumulator in which the stationary winding unit is cut off from the weft feed unit by the rotating thread taken radially outwards.

Weft accumulators with rotating winding units has in principle the characteristics the twist is imparted to the yarn between the weft accumulator and weaving machine during the beat-up. Depending on the direction of (~~rotating~~) rotation of storage unit and direction of yarn twist, there will be increase or decrease in twist.

The weft length to be wound is automatically controlled by using photoelectric means. Models are available with winding speeds above 2000 mpm.

WEFT MEASURING SYSTEM :→

When weft is inserted by means of fluid i.e. air or water jet, the motion itself does not determine the length of weft inserted. So it is essential for air and water jet loom not only the weft accumulators must be provided but also any type of weft measuring devices should be present. More lengt will produce more waste while short one would lead to a faulty cloth.

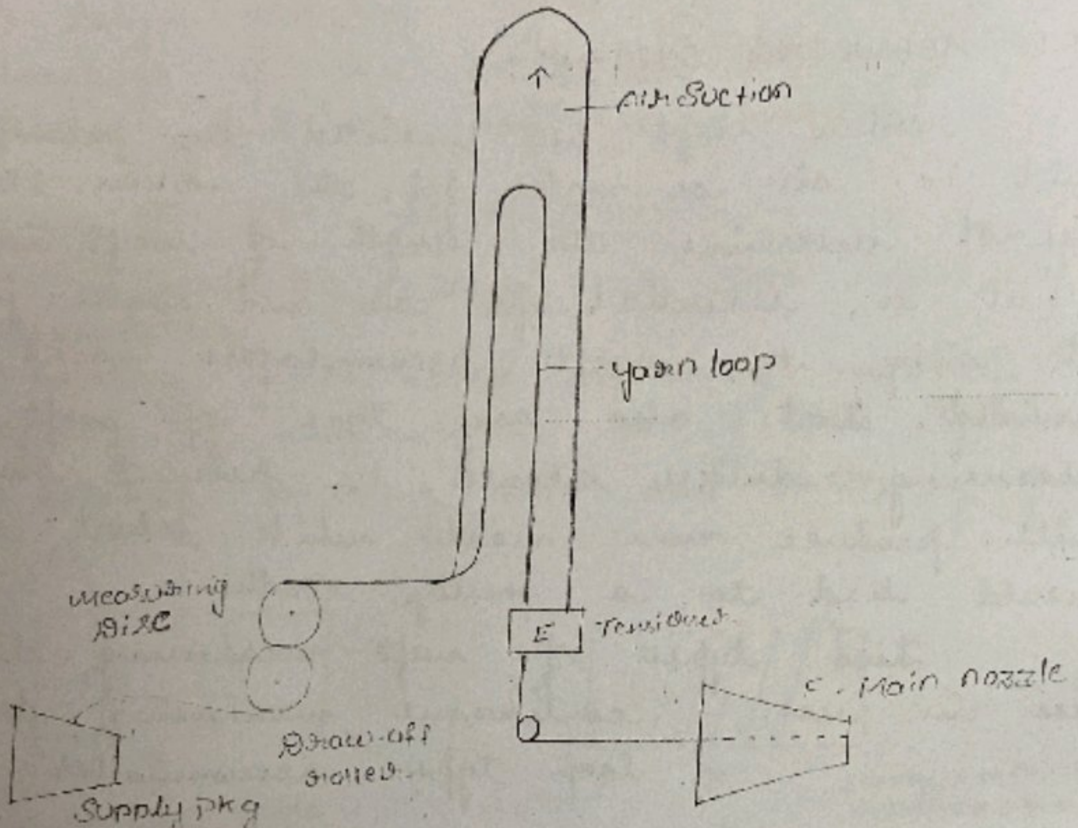
Two types of weft measuring devices are in use – continuous measuring drum.
– loop type accumulator.

LOOP TYPE ACCUMULATORS :→

This type measures off the weft by drawing it from the supply package at an appropriate rate, with the aid of a rotating drum and a pressure roller, and then storing a pick length by sucking it in the form of a loop into a tube lying between the drum and the nozzle of the jet

REG The diagram of loop type accumulators is given in the next page.

LOOP TYPE ACCUMULATOR



REQUISITIES FOR SUCCESSFUL INSTALLATIONS OF SUCCESSFUL WEAVING MACHINES :-

Before installation of these looms, basic requirements for successful working of these machines are to be considered that are given below:

1. Selection of machines
2. Technical Requirements
3. Economic aspect
4. Yarn quality
5. Yarn preparation

1. SELECTION OF MACHINES :-

There are currently over to different types of weaving machines available, operating on different systems of weft insertions:

BROAD CATEGORIES OF WEAVING MACHINES ARE:→

1. ⇛ Rapier weaving machine a) Rigid type
b) Flexible rapier type.
-: Sulzer Ruti, Somet, Picanol, Nuovo pignone.
2. Projectile weaving machine - Sulzer Ruti, STB.
3. Air jet weaving machine - Nissan, Toyoda, Sulzer Ruti, Inverta, Picanol, Tsudokoma.
4. Water jet weaving machine - Tsudokoma, Nissan.
5. Multiphase weaving machine - Nuovo Pignone, Sulzer Ruti, SMT, contis.

Following aspects are to be considered while deciding the type of machines.

1. Product range to be manufactured.
2. Versatility and its implication on capital cost of machines - every additional attachment means additional cost.
3. Return on investment based on productivi
4. Building requirements.
5. Yarn preparation equipment.
6. Upgrading the spinning to improve the yarn quality.

2. TECHNICAL REQUIREMENTS :→

Technical Requirements of weaving machines can be specified with the foll.

1. Warp shedding method - cam, +ve dobby or Jacquard.
2. Colour pattern selection and sequence.

3. Weft yarn count range which can be han
4. Machine width, type of selvedge.
5. Fabric density which can be woven.
6. Field of application and warp count rang

3. ECONOMIC ASPECT :→

Economic aspects to be considered those machines which fulfils technical requi

a) cost in respect to capital and personnel
b) Power, spare parts and auxillary equipmen
c) Building and maintainence.
d) Quality loss due to defect.
e) wastage.
f) Availability and cost to spare and auxi parts.

WEAVING MACHINE WIDTH (CM)	FABRIC THAT CAN BE MANUFACTURED
190	Two width shirtings, 1 suiti or sheetings
280	2 shirtings, 2 sarees, sheeting
330	3 shirtings, 2 suitings, shir denims, corduroys
383	3 shirtings, 2 suitings, shi denims, corduroys.
465	carpets, geotextiles
541	carpets, geotextiles, paper making felt.

4. YARN QUALITY :→

Tension on the warp on a high speed shuttleless weaving machine is higher than that of on a conventional loom. On some rapier looms, interference by rapiers, can caus bending of the top yarn sheet around the rapier head producing excessive warp strain on the selvedge region of warp.

Quality of yarn should be atleast within 25% uster which means the quality is among the best 25% of the mills in the world.

Normally shuttleless weaving machine works 3 to 4 times faster and if the quality of warp remains the same, warp breaks will increase 3-4 times resulting in low prodn. Hairy yarn will not be suitable in weavin in air jet loom. The following parameters such as C.V. of count, single thread strength, imperfections in 100 mts are to be considered.

5. YARN PREPARATION:→

Because of smaller shed size, reed sweep and abrasion time, if the warp preparation standard comparable with those acceptable for automatic looms is used, there will be less warp breakages when the same yarn is used on high speed looms. Yarn imperfections fail to pass into cloth on projectile weaving machine because of following:

i) The reed is less flexible.

ii) The characteristics of beat-up are consider to be more detrimental than those with conventional sley.

iii) Number of abrasion cycles is more ~~than~~ because of high speed.

a) WINDING:→

All the medium and fine counts and all blended yarns with polyester component should be wound on automatic winding machines like autoconer, murata etc. Each thick place should be assessed with respect to its length, and only objectionable faults may be removed. This is possible with electronic yarn clearer and uster classimat. Fisherman's knots are preferred. Size of the tail ends of knots should be small. Spliced give good results. It would be desirable that a splicer is provided instead of a knotter on a winding machine to get rid of disadvantages of knots.

b) WARPING:→

At warping the goal should be that there should not be any missing end. Number of breakage should not exceed seven per ten million meters. To achieve this, the following warping process parameters are to be observed:

- Precise creel allignment.
- Reliable stop motion at creel and at warping drum.
- Minimum wobbling of warping beam.
- Uniform selvedges with good flanges.

Yarns should be preferably warped on spindle driven machines to avoid thermal damage due to abrasion. Warping machines such as Benninger, Hacoba or B.C. are preferred.

c) SIZING:→

The sizing process greatly influences the performance of the shuttleless weaving machines. The single end concept of sizing is more ideal for yarn prepared for all shuttleless weaving machines. This method facilitates proper encapsulation of size on the yarn and reduces hairiness.

Double size boxes are recommended to avoid over crowding. After waxing with PE glycol is advisable for shuttleless weaving machines to achieve a clear shed formation while selecting the recipe consideration should be given to warp count, construction of fabric and weave.

d) WEFT PREPARATION:→

Weft insertion rate is high and unwinding is intermittent on shuttleless weaving machines, hence it is necessary to have a hard wound package. It is also essential to have anti-patterning device to prevent slough-off on the fabrics.

For spun yarns, parallel wound package gives a good performance, Smaller core diameter of package increases the ~~waving~~ unwinding tension and high weft breakages

MINIMUM DOWNTIME:→

The important consideration with high speed, high cost looms is the need to keep the loom downtime to the minimum at the time of warp charges. It is necessary to have a large run for the machine by adopting larger beam flange upto 1000 mm. At the time of knotting downtime should be reduced good team work and organisation of that lea, gaiters, assistant gaiters and cleaners. Time taken for knotting and beam changing is dependent on the type of fabric, no. of ends no. of width weaven.

BUILDING AND FLOOR CONSTRUCTION :->

Building: For modern machines, especially wide weaving machines running at high speeds, bu should be modified or a new plant to opted. Production hall should be as large possible in order to have wider spacing. have transportation of weaver's beams; dra sets with weaver's beam, transport equipmen such as lifting trolley, beam trolley etc.

FLOOR CONSTRUCTION :->

Floor construction for laying the machine on floor depends upon condition of the ground upon which the building stands.

The load bearing capacity of a fact floor is determined by the static and dynamic stresses of the machine running on. The static stress is known from the weight while the dynamic stress is calculated fr the vibration of the individual machine.

Other conditions like adequate lighti arrangement, free space for material movemen and store and proper layout should be che

HUMIDIFICATION :->

Economy of the weaving machines a the quality of the fabric depends as muc as on humidification system as on the quality

of warp and weft yarn and their preparati
Humidification differs for filament weaving
and spun yarn weaving. For cotton and bl
75-80% R.H. and for filament weaving 70-

Design conditions will depend upon:
(i) Dry bulb, wet bulb and R.H. in summer and winter.
(ii) R.H. required in the production shed.

Different types of humidification available
- Air washer plant
- Refrigerator
- Air conditioning.

CONTROL OF DUST, FIBRE Fly AND HUMIDITY:→

With increasing weft insertion rates efficient control of air borne fly is mu in a modern weaving operation. Many stopp are caused by fibre fly. Fibre fly is the reason for many faults which cannot be repaired. Overhead cleaners for looms are nee and blowing and suction type of jet clean are provided for a set of loom.

By injection of the conditioned supp air at ceiling level and capture of the extract air below the weaving m/c uniform humidity as well as efficient dust and fly control are maintained in the weaving area.

MACHINERY MAINTAINENCE :-

Maintainence is generally considered a wastage of time taken away from the product time. For high speed weaving machines systematic preventive maintainence, checking and counter checking of work is a must to give max. production of quality product at minimum cost by reducing the downtime due to breakdo and stores and spares shortages.

TRAINING :-

It is the man ~~who~~ not the machin who plays a key role in the process of technological transfer. Success of an organisation depends upon:-

(i) Highly qualified top management.
(ii) Efficient middle management.
(iii) Professionally trained skilled personnel.

Training of personnel should be considere as long term investment in human resources which keeps and improves company's competitiveness

Selection of personnel should be on the basis of academic qualifications, age, skill and aptitude observed.

WEAVER'S TRAINING:- Training comprises of foll topics:

a) basic function of machines.
b) Practice for making weaver's knot.
c) Starting and stopping the machine..
d) Weft threading, pick finding.
e) Understanding dobby, four colour mechanism, accumulator, electronic system.
f) attending warp and weft breaks, selvedge drawing
g) Understanding m/c faults, cloth defects & remedial actio

PROJECTILE LOOM.

INTRODUCTION :→

Sulzer Brother, Switzerland who are pioneer i the field of projectile, method of weft insertion, have been able to convert a brilliant concept of Rosman into a viable commercial weaving machine, known as Projectile weaving machine and introduced in the market in 1953. The main feature of this weaving machine. is its weft insertion system. A bullet like shuttle, 90mm long and weighing about 40g, technically named as gripper projectile, draws the weft thread into the warp shed from a large, stationary cross-wound package always from the same side. A metal torsion rod propels the projectile, accelerating it through the shed. at the moment of picking by means of a picking mechanism.

Sulzer projectile weaving machine differs from a conventional automatic loom mainly in two respects:

a) the method of insertion of weft into t warp shed.

b) the method of moving the reed and the projectile track.

MAIN FEATURES OF PROJECTILE WEAVING MACHIN

1. The picking and projectile receiving unit are separated from the moving sley. The sley carries the reed and gripper guides.
2. The gripper projectile, made of fine steel, 90mm long, 14mm wide and 6mm thickness

weight 40g. It carries the weft thread in the warp shed.

3. The weft is drawn directly from a large stationary cross-wound package. There is no weft winding.

4. The gripper projectile is picked across the warp shed at very high speed, the picking energy being derived from the energy stored in a metal torsion bar, which is twisted a predetermined amount and released to give projectile a high rate of acceleration.

5. Picking always takes place from one (~~Place~~ to ~~another~~) side, but several projectiles are employed and all of them return to the picking side a conveyor chain located underneath the warp shed.

6. During its flight through the shed the projectile runs in a rake like steel guide so that the warp threads are touched neither by the projectile nor weft thread.

7. Every pick is cut off at the picking side near the selvedge after weft insertion leaving length about 15mm from the edge. Similar length of weft also projects from the selvedge on the recieving side.

8. The ends of weft threads projecting on both sides of the cloth are tucked into the (~~cloth~~) next shed by means of a special tucking device and woven in with next pick thus providing firm selvedges.

9. The reed is not reciprocated as in a shuttle loom, but rocked about its axis by a pair of cams.

10. The reed and projectile guides are stationary during pick insertion.

11. The sley which carries the reed and project guides, is moved forward and backward through a saddle carrying two followers bowls, which bear against the surface of two matched cams.

12. A sley dwell of 255° at back centre enables the projectile to travel through the warp shed without being unnecessarily reciprocated by the sley.

13. Whenever the reed width is reduced for weaving a small width cloth from the std. reed width, the projectile receiving unit is moved inward on the telescopic shaft, to the new selvedge position, and so the projec travel distance is reduced.

14. Smaller shed opening because of the smaller size projectile. This will result in lower warp breakage rates.

15. Weft insertion rate upto 900 ~~to~~ 1500 m/min is possible depending upon the width of the weaving machine.

16. The colour changing mechanism is less complicated.

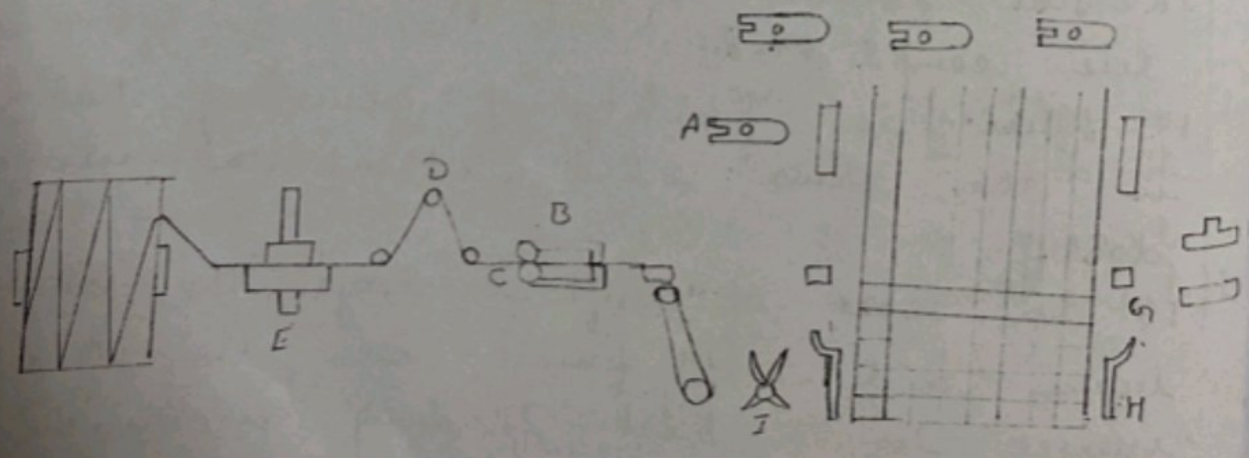
17. There is facility of inserting two picks in the same shed without the use of a dobby.

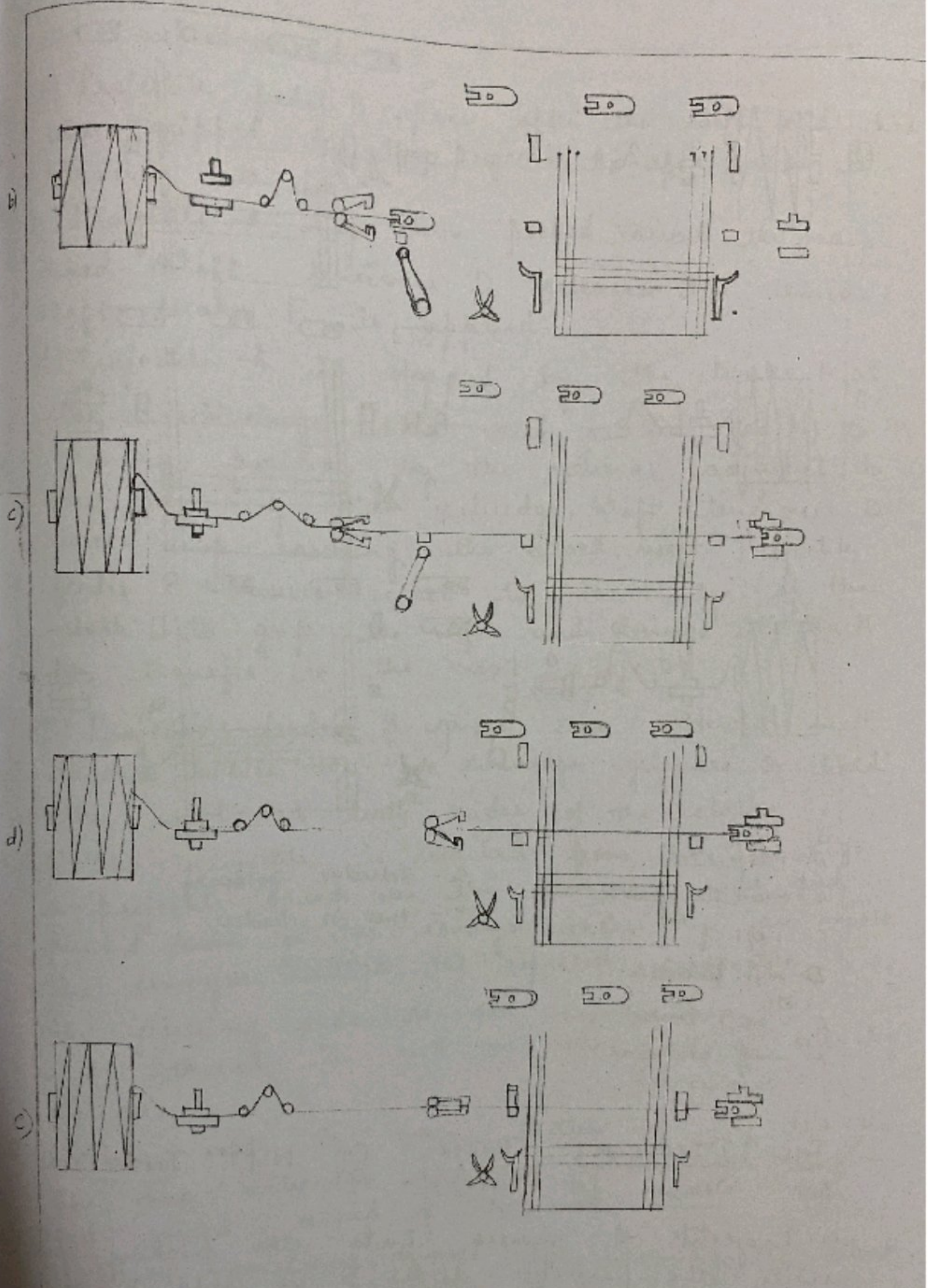
18. In case of weft breakage, the take-up beam and heald frames can be driven in reverse by a pick finding mechanism.

ADVANTAGES OF PROJECTILE WEAVING :→

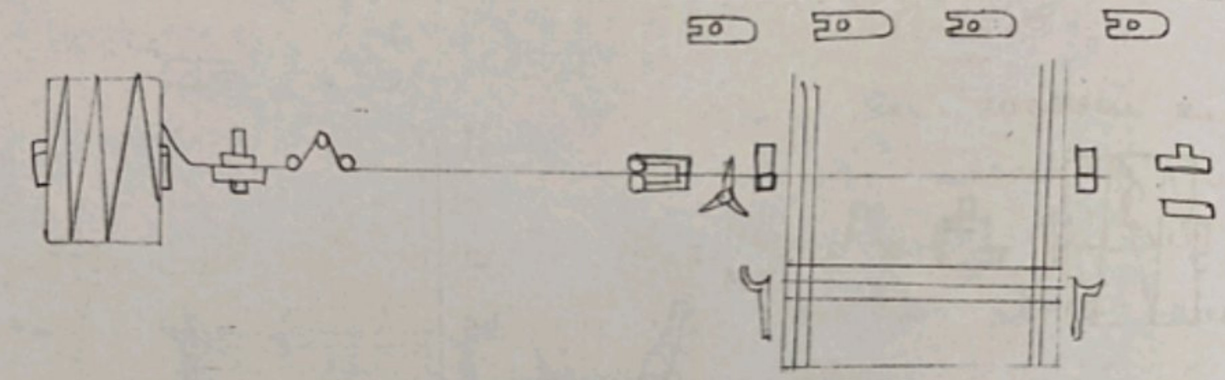
1. Two or three cloths can be woven simult
2. It is possible to achieve weaving perform with breakage rate of per square metre of 50% of the number of breaks that would occur on a conventional loom.
3. The lower warp breakage rate due to :→
   - smaller warp shed.
   - Reed with higher ratio of air to reise.
   - Beat-up line being nearer to the cen of the reed between the two banks.
4. Since the projectile is passing through the guides there is no reed to projectile or projectile to yarn ~~count~~ contact.
5. With the introduction of 4/6 colour weav machine all the mechanical problems of conventional pick and pick multicoloured lo are eliminated.

DIFFERENT PHASES OF WEFT INSERTION OF PROJECTILE WEAVING MACHINE :




b)
c)
d)
e)

f)



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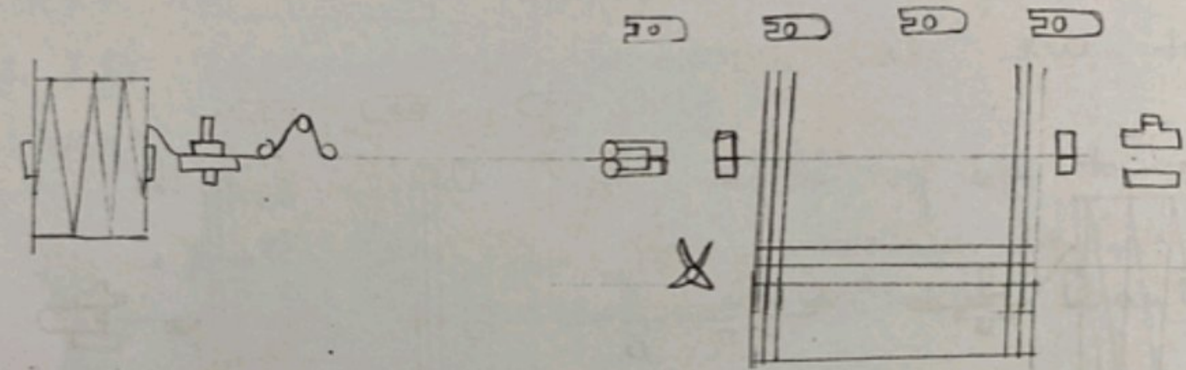
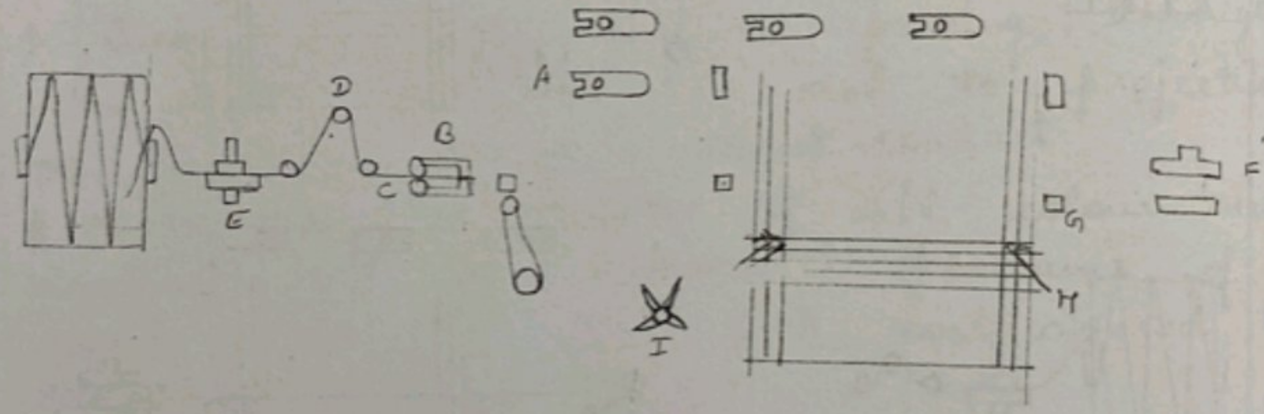




A - Projectile
B - Projectile feeder
C - weft
D - weft tensioner
E - weft brake
F - weft brake at receiving side

G - Selvedge grippers
H - tuck-in-needles
I - Scissors

THE DIFFERENT PHASES OF WEFT INSERTION ARE SHOWN IN FIGURES :→

(a) Projectile A moves into the picking positi while the projectile feeder B is holding the end of weft C. Weft tensioner D is applying tension to the weft. Weft brake E is holdi the weft thread.

(b) Projectile feeder B opens after the weft end has been gripped by the projectile A, weft brake is releasing the force.

(c) Projectile A has been picked across the warp shed. Weft tensioner D releases the tension. Weft brake E is applied.

(d) Projectile A is stopped by the brake F at the receiving side and pushed back to the opening position by the returner, adjacent to the receiving side selvedge, Weft tensioner D moves up carrying the slack weft. Projectile feeder B moves close to the edge of the cloth to grip the weft and bring it back for transfer to the next projectile.

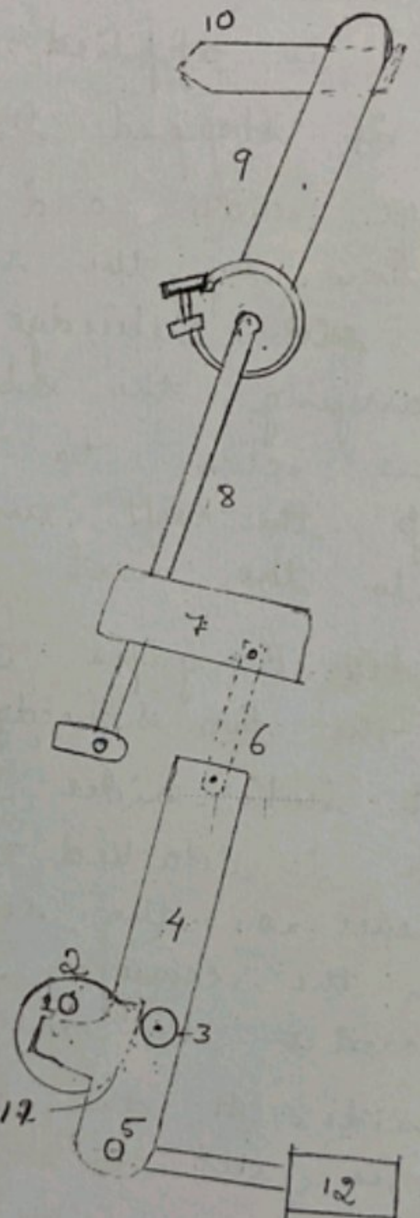
(e) Projectile feeder B grips the extended weft thread while the two selvedge grippers G hold the weft at both sides of the cloth.

(f). The projectile is detached from the weft by a projectile opener on the receiving side and pushed down on the conveyor chain by an expeller. The conveyor carries the expelled projectile to the picking side. At the same time the weft thread is cut on the picking side by scissors I.

(g) The weft is now beaten up by the reed. The two selvedge grippers holding the weft ends move ahead of the reed.

(h) Weft tensioner moves up carrying the slack weft while the projectile feeder returns to the original position gripping the weft end for repeating the operation.

TORSION BAR PICKING MECHANISM :-

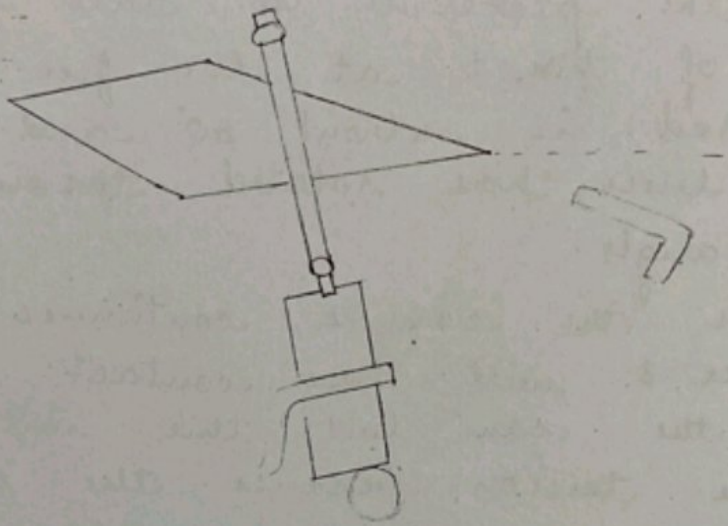


1. Pkg cam shaft
2. Pkg cam
3. Roller
4. Toggle lever
5. Fulcrum
6. Link
7. Torsion lever
8. Torsion Rod
9. Pkg lever
10. picker
11. Curved contour
12. Oil brake.

The picking cam shaft 1 which rotates once every pick, has a picking cam 2 which rotates in clockwise direction. In the fig shown, the cam gradually displaces the roller 3 and turns the toggle lever 4, to which it is attached, in a clockwise direction about its fulcrum 5. In doing so, it has twist the free end of the torsion rod 8 through the link 7 and the torsion rod lever 7, which is secured to the torsion rod 8 near its free end. The picking lever 9 is attached to the free end of the torsion rod 8 and carries the picker 10. At this stage the amount of twist at the free end of the torsion rod. is about 30° and the picking lever has rotated through a similar angle.

As the cam 2, continues to turn, the roller 3 will lose contact with the nose of the cam, but this will not release the torsion because the axis of the link 7, when produced, passes to the right of the axis of the fulcrum 5. Sometimes after the cam nose has cleared the roller 3, another roller which is fixed to the cam 2, turns the toggle lever 4 slightly anti-clockwise by depressing its curved contour 12. As soon as this movement brings the axis of the link 7, when produced, slightly to the left of the axis of the fulcrum 5 of the toggle lever the system collapses and torsion is practically instantaneously released. The picker then accelerates the projectile over a distance of about 65 mm. The picker and the rest of the lever system are then brought to rest over the next 40mm of picker movement by the oil brake 13, which acts on the hydraulic principle. The speed of the projectile as it leaves the picker is about 24 m/s.

BEAT UP MECHANISM:→



The beat-up mechanism is sulzer ruti projectile weaving machine is different from the conventional crank and crankshaft. They sley is positively rocked about its centre by means of matched cams. A saddle carrying two anti-friction rollers, is attached to the sley and these rollers bear against the surf of the cams. There are several pairs of such cams spaced at intervals across the width of the sley. The sley carries a reed and number of projectile guides. The mass of the sley which is about 16kg in 220cm. m/c is small compared to that of shuttle looms.

The projectile guides are used for the smooth movement of the projectile through the warp shed. During the beat-up of the weft the guides move down from the shed and lie below the cloth near the fell. The weft thread which lies inside the guides slides clear during their downward motion. Because of the cam operated sley it is possible to have a sley dwell of 255° at its back centre. During beat up the sley moves for 52.5° and another 52.5° is spent to move to the back centre.

SELVEDGE FORMATION :-

The Sulzer Ruti machine produces a tuck-in selvedges which has been studied. After the thread (weft) has been severed by the scissor The tucking needles provided on both ends of the cloth, tuck the projecting ends into the ~~cloth~~ next shed and beaten up along with the next pick. The selvedge formed will be about 15mm wide. The disadvantage was the thicker selvedge compared to the body of the cloth. This defect was reduced through,

(a) Choice of suitable weave for the selvedge.

(b) Reduction in the number of warp ends at selvec

(c) Using finer warp ends in the selvedges.

RAPIER LOOM.

FUNCTION :→

Insertion of weft by rapier is a mechanic modern and refined version of the primitive mo of fabric production in which the weft was sec in a slot of a stick. The gripper heads are attached to rapiers which are flexible tape or rigid rods. The rapiers are made of coate steel or reinforced high performance man-made fibres like carbon.

CLASSIFICATION OF RAPIER WEAVING MACHINES :→

The rapier weaving machines can be classified as, by the following criteria:

a) number of rapiers
b) method of weft insertion
c) type of rapier
d) Positioning of the weft insertion mechanism.

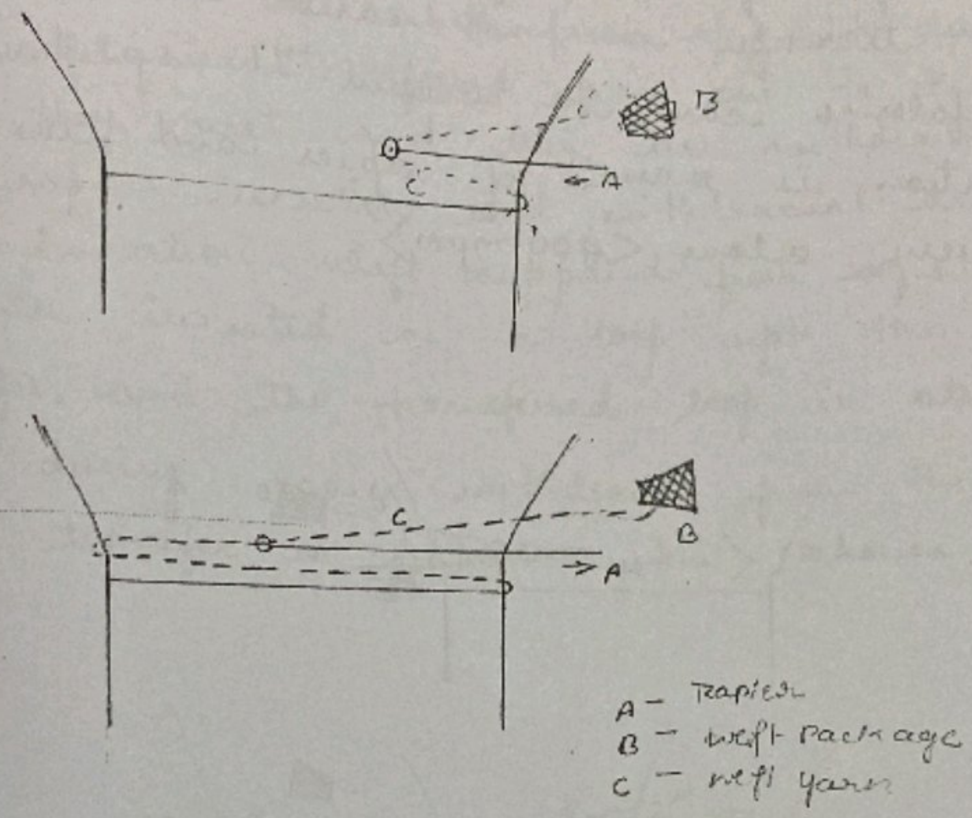
a) Number of rapiers:

Rapier weaving machines can be catego according to number of rapiers as single or double rapiers. Again single rapiers can be classi as:

1. insertion of single picks
2. insertion of double picks.
3. two phase rapier.

1. Insertion of double picks:

The rapier enters the shed from weft supply side and the weft is permanently threaded through a hole at the tip of rapier. Conventional selvedge is formed on the weft sup side and the other side can be secured either by knitting them together.

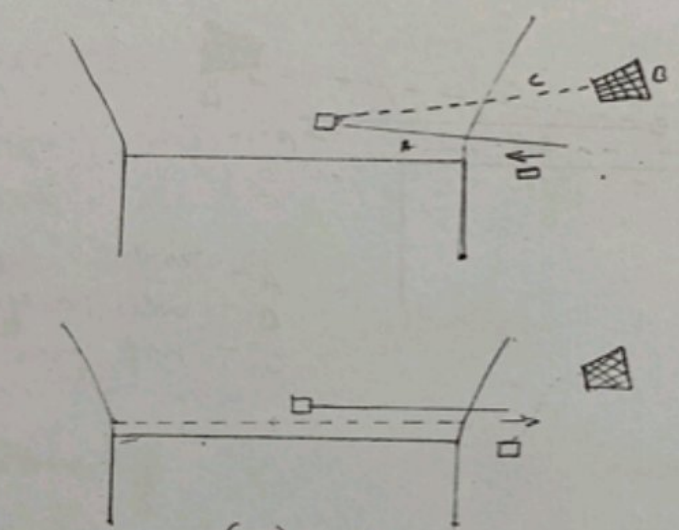


Since double picks are inserted, there is no need to cut the weft and no weft wastage bu the weft insertion speed is twice the speed of the rapier insertion speed. Further more there is constant rubbing between the yarn and rapier eye during the insertion as well as the withdrawal.

2. <u>Insertion of single pick:</u>

Here in each loom the tip of the sing rapier is inserted either during rapier insertion or rapier withdrawal and is inserted across the whole width of the shed and withdra

This system is known as IWER System. The m advantage of this system is the problems of weft transfer do not arise and normal ra of fabrics can be woven. The speed of weft insertion is same of rapier and the loom sp is very slow <400 mpm>.

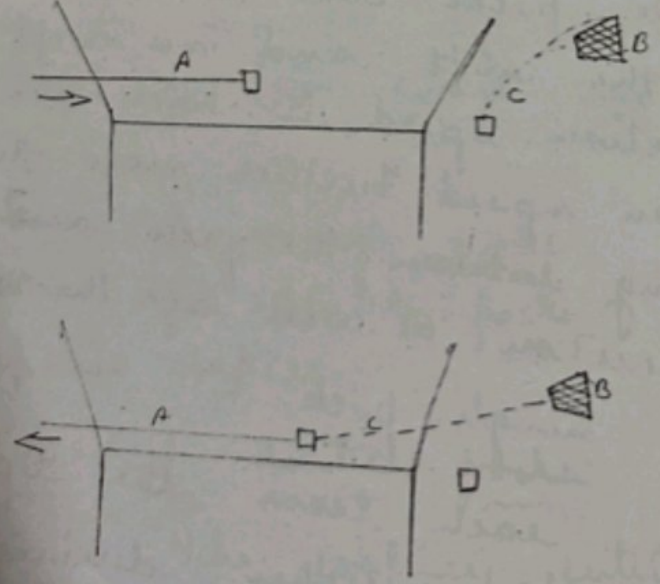


(a)

A - Rapier

B - Supply pkg or weft pkg

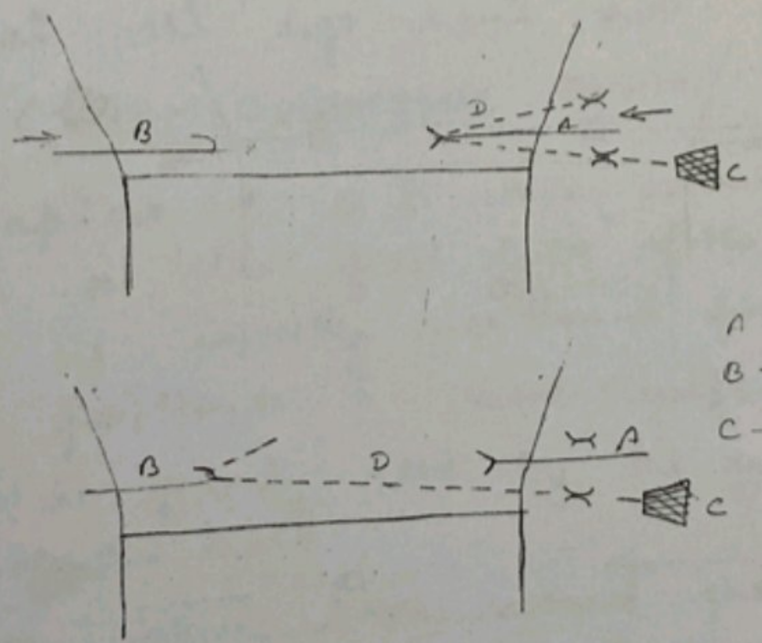
C - weft yarn



(b)

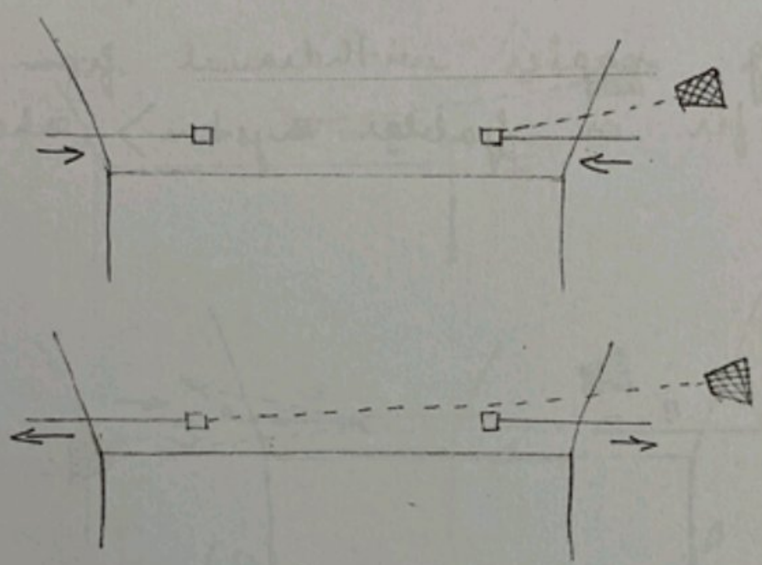
Double Rapier.

With double rapier system, normally two rapiers enter the shed from opposite ends and the weft is transferred from one to the other when they meet and they are withdrawn. Thus both rapier insertion and withdrawal are used for weft insertion. Weft supplied from a single package may be inserted as a loop upto the time of transfer, and the transferred loop is straightened out during rapier withdrawal from the shed. <loop transfer or Gabler system>, shown below.

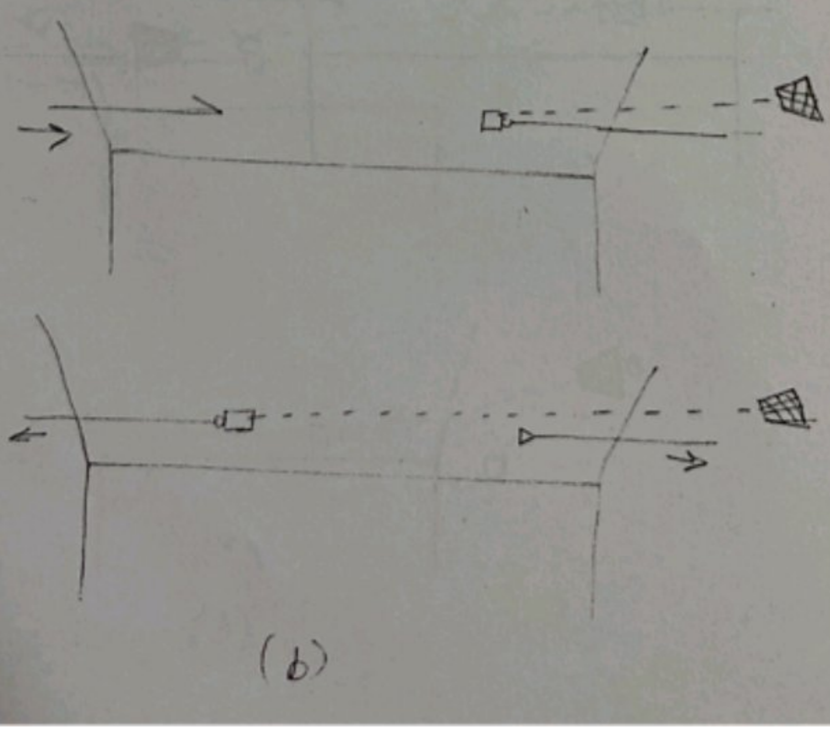


A - Right hand Rapier
B - Left hand Rapier
C - weft package
D - weft yarn

In tip transfer or Dewas system, the end of weft is directly transferred from one rapier to the other rapier. Yarn clamps are required in the heads of both rapier, shown in fig(a). other system, the yarn clamp is transferred fr one rapier to the other rather than the yarn itself, which remains gripped by the same cl throughout shown in fig(b).



(a)



(b)

(b) method of weft insertion:→

Rapier weaving machines can be classifi according to method of weft insertion, as Dewas or Gabler system.

GABLER SYSTEM:

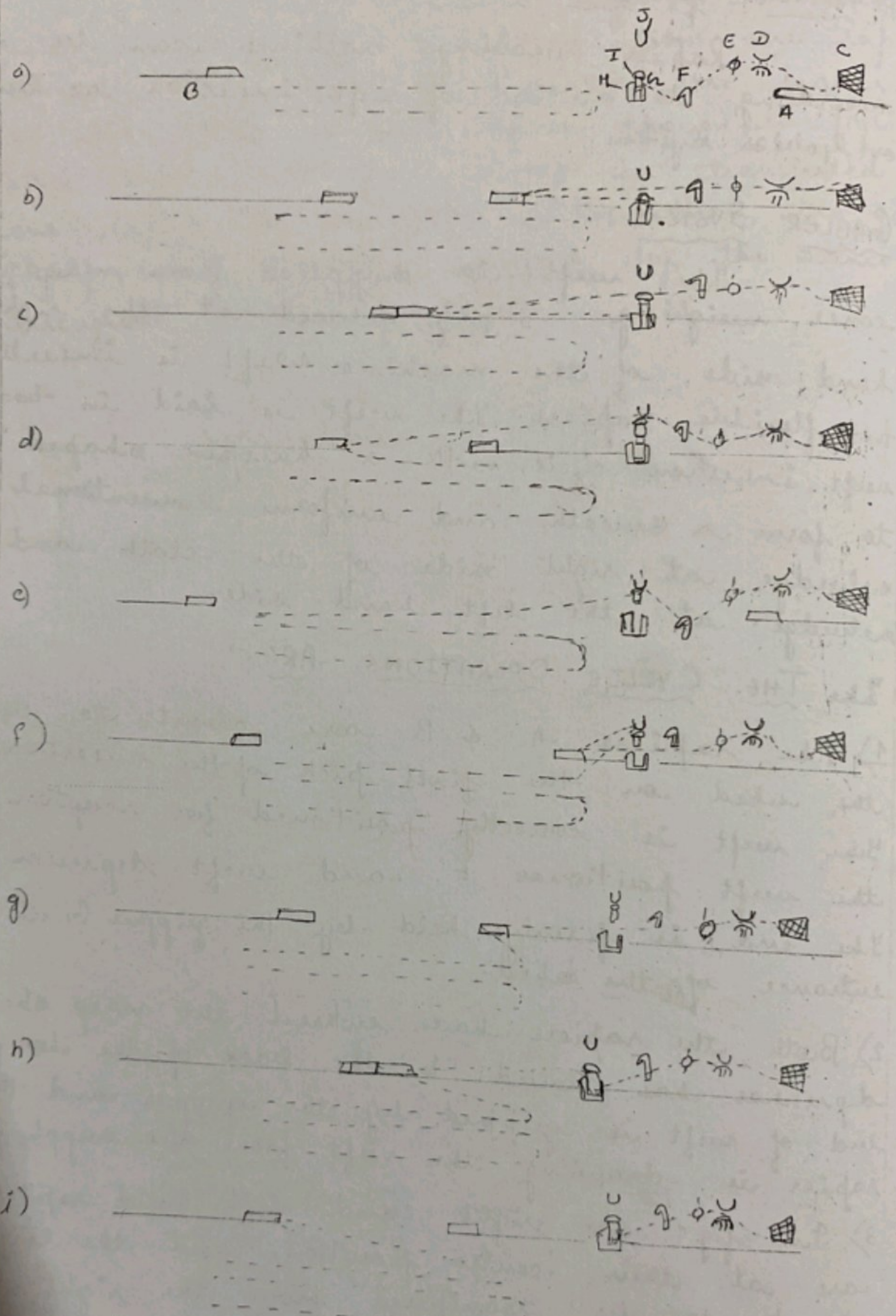
The weft is supplied from magazined cones weighing 3-4kg placed at the right hand side of the machine. Weft is inserted by two flexible rapiers. The weft is laid in two pick weft insertion cycle, with a hairpin shaped loop, to form a smooth and uniform conventional selvedge at right side of the cloth and leno selvedge at the left hand side.

THE CYCLIC OPERATIONS ARE:→

1). The rapiers A & B are about to enter the shed on the first pick of the insertion cycle. The weft is correctly positioned for reception by the weft positioner E and weft depressor F. The end is firmly held by the gripper G at the entrance of the shed.

2). Both the rapiers have entered the warp shed an depressor has moved to the back of the loom. The end of weft is gripped by the gripper and the rapier is drawing the weft from the supply packa

3). In fig c. the right and left hand rapiers are at their centre position. and the loop is about to be transferred from the right hand rapier, The weft clamp is closed to stop supply of weft from the package and grippe



A - Right hand Rapier
B - left hand Rapier
C - weft supply pkg
D - weft clamp

E - weft positioner
F - weft depressor
G - weft gripper
H - weft cutter

I & J - weft guide Comp

4). In fig d, free end of the weft is drawn through the reminder of the shed by the left hand rapier. Depressor F is moving back to th weft back for the second pick.

5). In fig e, the first pick is fully inserted, the depressor F, is at its forward most position, th weft clamp D is opened and weft is held by the weft guide components I and J.

6). In fig f, the beat up of the first pick has been completed and the right hand rapier is again advancing towards the open shed. The weft depressor is at its backward position an the weft is supplied from the supply packag

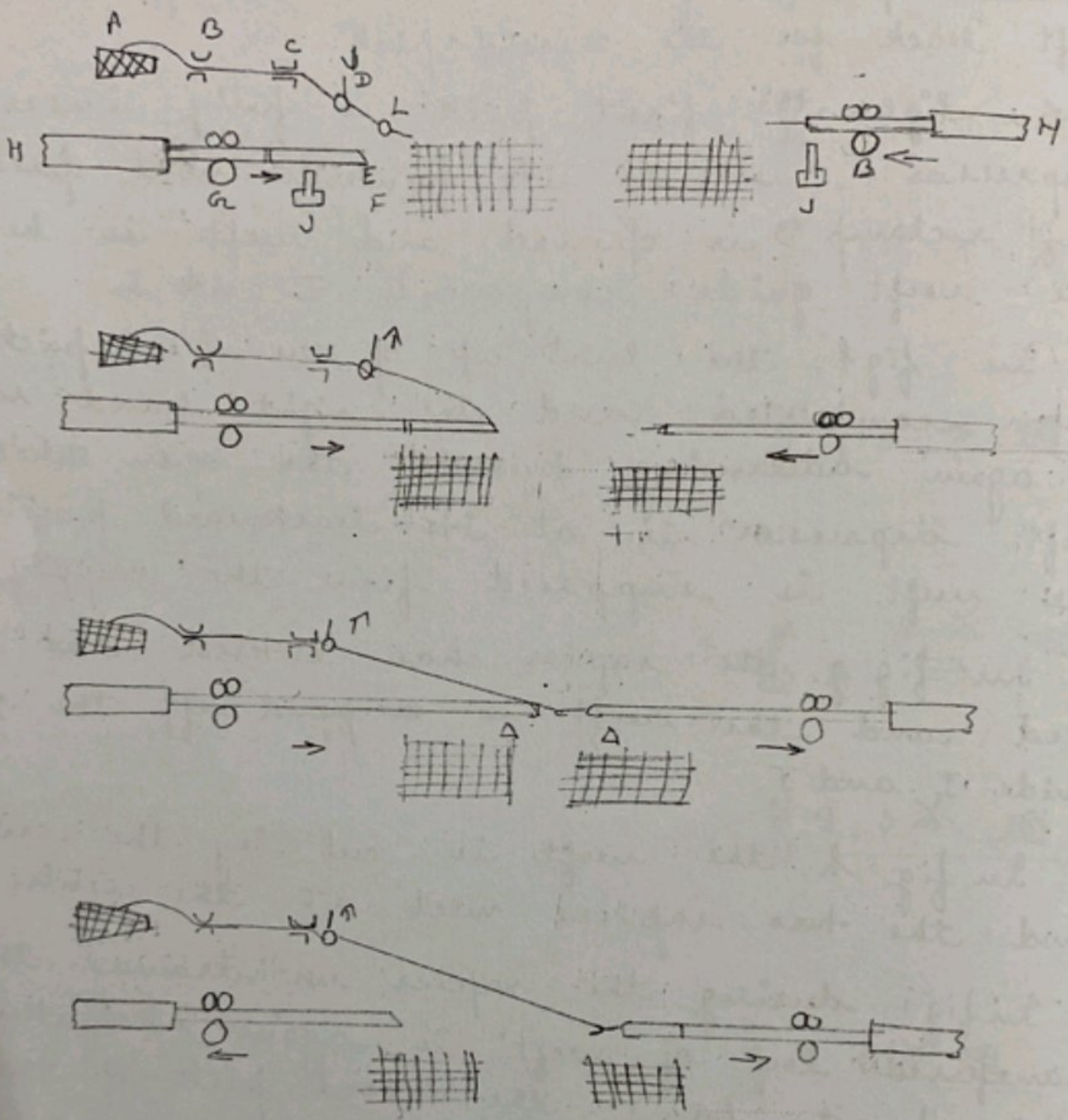
7). In fig g, the rapier has entered the warp shed and the weft is slipped off the weft guide I and J.

8). In fig h, the weft is cut by the cutter H, and the two rapiers meet at the centre.

9). In fig i, during the rapier withdrawal the transferred loop of weft is again straightened out and it forms the second pick of the cycle. After shed change and beat up the whole cycle is again repeated.

DEWAS SYSTEM OF WEFT INSERTION :→

The supply packages A are mounted in seperate compartments of the maganize, each having two spindles one for the running package and the other for reserved package. Eac weft yarn passes through the thread eye. B of its compartment and through a weft tensioner device C. If necessary weft accumulators can be used.



A - Supply pkg
B - Thread eye
C - Tensioning device
D - eye of vertical selector needle
E - left hand Rapier
F - Right hand Rapier
G - Cam operated plate
H, I - opener levers.
L - position of scissors
J - Cam operated plate

The cyclic operation of weft insertion is as follows:→

1). In fig(a). the needle D presents the weft to the advancing left hand rapier E which nips the weft as it enters the shed.

2). In fig(b), at this point the weft still connected to the previously inserted pick but upon continued advancement, the connect is severed by a knife blade.

3) The rapiers continued to move through the shed. The right hand rapier reaches the m/c centre a little bit earlier and is opened by the right hand opener lever H whereas the left hand rapier inserts the weft into the right hand rapier. Due to split shape of the left hand rapiers the yarns forms a bridge during this operation. Then the right hand opener lever (I) close the right hand rapier. As soon as the right hand rapier has safely clamped the transferred weft, the left hand opener H opens the left hand rapier F, i.e. giver to taker. The opener lever H and I, are driven by cams. The weft continues to unwind as the right hand rapier is withdrawn outwards. After ~~(reducing)~~ reaching a position beyond the selvedge, the weft is released by the right ~~left~~ hand rapier. In the meantime, the left hand rapier returns idly to its original position. As the weft is gripped by jaws, weft scissors positioned at L cut the weft.

c. Types of Rapiers :-

RIGID RAPIER: The rapiers are made of rigid tubes of steel alloys or plastics reinforced with carbon fibres in various cross section shapes. They do not need any guides during their transverse within the shed, but in some cases guidances is provid at the shed boundary. Rigid rapiers offer more efficient yarn control and are very versatile. A very range of yarn counts, types of yarns, and fabrics can be woven on the looms. The main disadvantage of rigid rapiers is the requirement of high space along the loom width about twice of shuttle loom. The rigid rapiers have model of loop or tip transfer. They are of both unilateral or bilateral types.

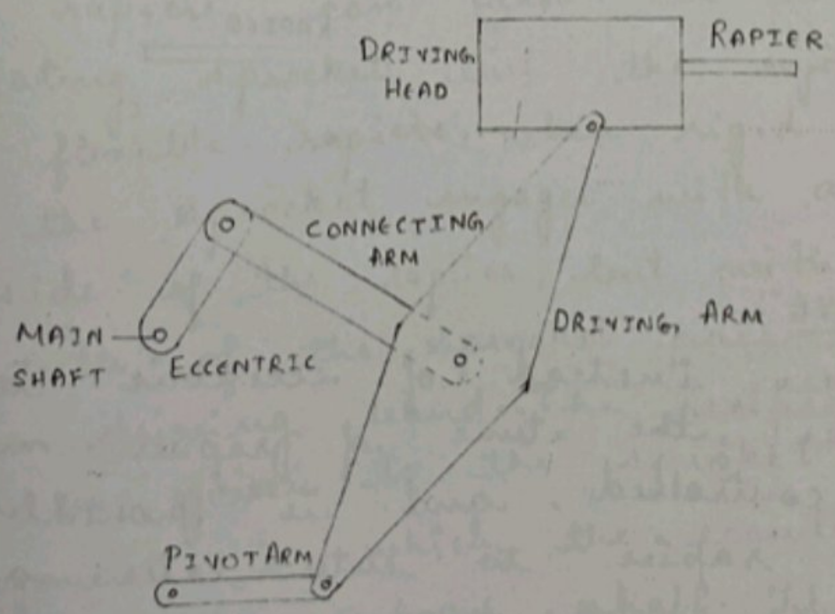
FLEXIBLE RAPIERS:→

In this case the gripper heads are propelled by rapiers made of flexi tapes of coated steel or plastics reinforced with carbon fibres. Upon withdrawal they are bent and accomodated in curved tracks. This reduced space requirement to that of rigid rapiers. The rapiers are guided in the shed to ensure precision for thread transfer at the meeting of the gripper heads attached to the rapiers. In some cases guidance is given by guide plates mounted on the sley at horizontal intervals across the shed width. The plates enter the shed through bottom warp sheet when the sley moves back, and return from the shed before beat-up. Flexible rapier loom are most suitable for light and medium weight fabrics, can be run at very high speed and occupies less space compared to rigid rapiers.

DRIVE TO RAPIERS :→.

ECCENTRIC DRIVE:

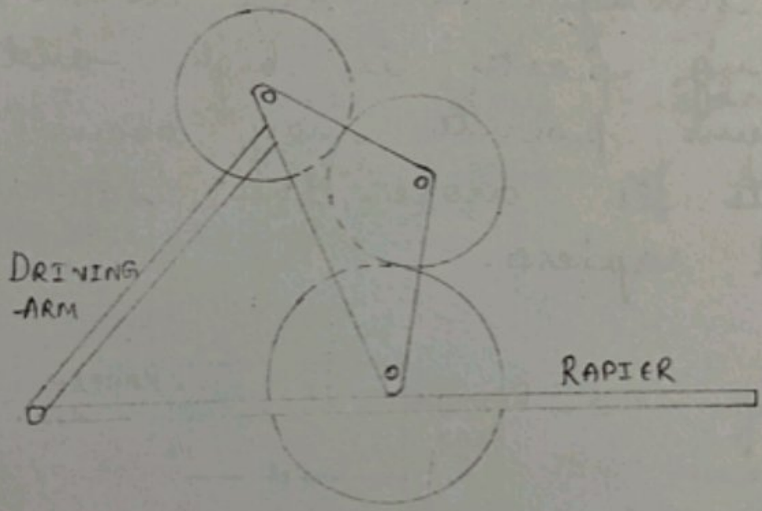
This is used mainly for rigid rapiers for which the rapier path is usually straight. In this drive, the mass of the moving parts is high and wear at the fulcrum points may occur. Space requirements is more. This system is used for rigid rapiers.



ECCENTRIC DRIVE

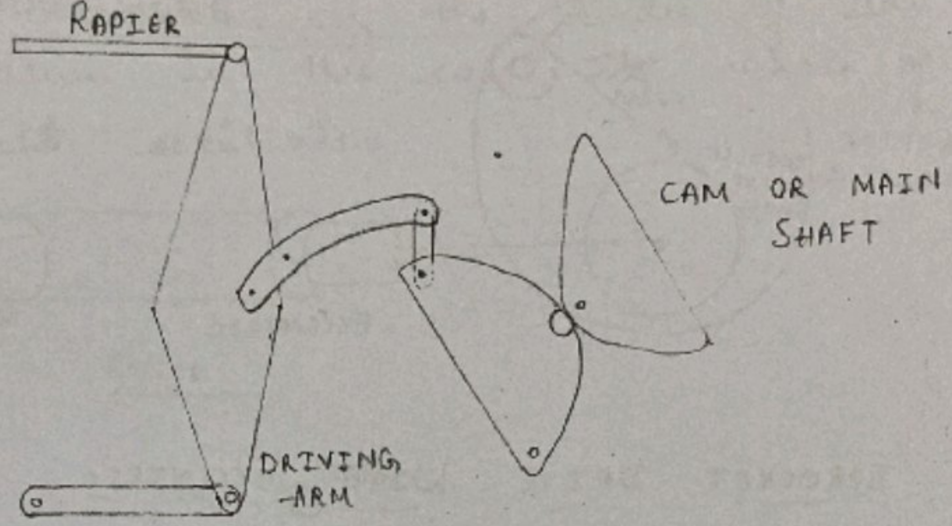
CYCLOIDAL GEAR DRIVE :→

The rapier is connected direc[tly] to the cycloidal gear driving arm. Th[e] arm is attached to the driving gear, which revolves round the main gear, wh[ich] inturn is driven from the main shaft [of] the loom. The need to use an interm[ediate] driving arm, a pivot arm, and an oscillating fulcrum is eliminated. This system is used for rigid rapiers.



CAM DRIVE :

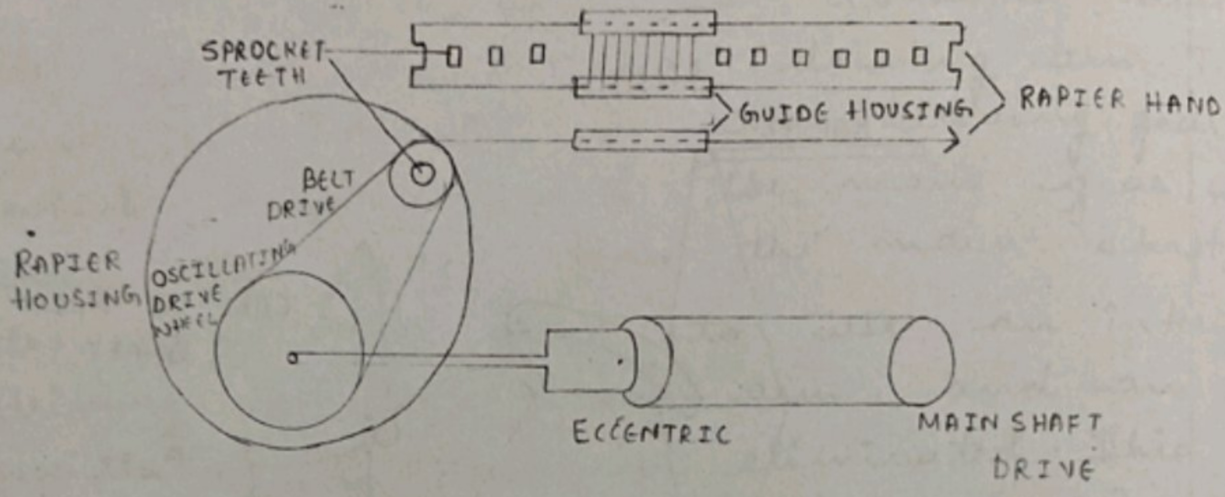
Here instead of eccentric a cam used. Since the time of rapier movement is now controlled, and is possible to allow the rapier to enter later and go into an open shed. This system is used for rigid rapier.



CAM DRIVE

SPROCKET DRIVE WITH ECCENTRIC :→

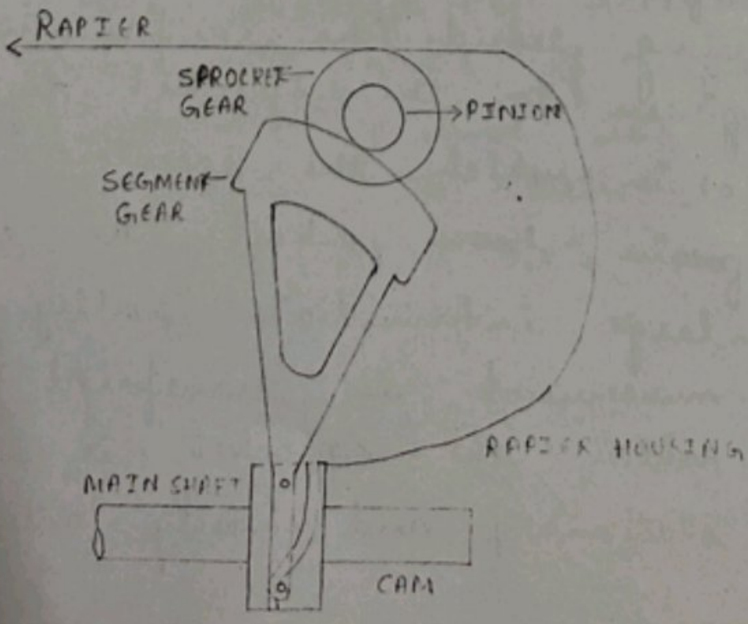
Rigid rapiers can also be driven by an oscillating sprocket, but the system is popular with flexible rapiers, when rigid rapiers are used, the sprocket engages with a rack on the underside of the rapier, but with flexible rapier the teeth of the sprocket pass through holes in a driving band. The reciprocating moveme may be given to the sprocket by a crank arrangement in which the eccentric is driven from the main loom shaft. The eccentric causes a large intermediate pulley to oscillat and this movement is transferred to second pulley to which the sprocket is attached. The drum is stationary and merely acts as housi for the withdrawn rapier.



SPROCKET DRIVE WITH ECCENTRIC

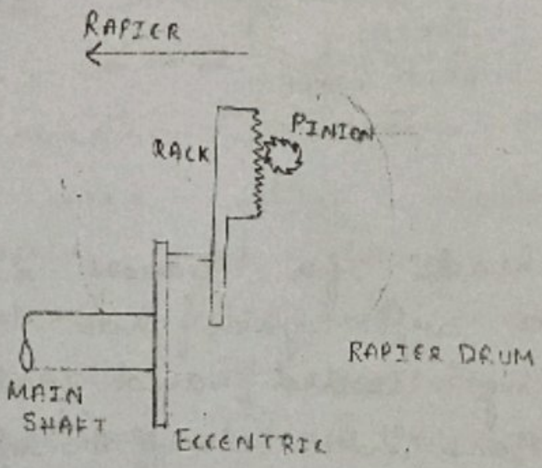
SPROCKET DRIVE WITH POSITIVE GROOMED CAM

A positive groomed cam reciprocates the lower end of a fulcrummed quadrant arm. The upper end thus oscillates a small intermediate gear to which the sprocket is attached. The drum is stationary and merely acts as housing for the withdrawn rapier.



RACK AND PINION DRIVE:→

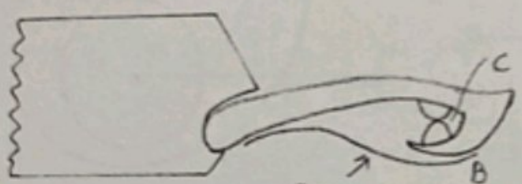
An eccentric may be used to reciprocat a vertical rack. This rack inturn will drive an gear mounted on the center of the rapier driving drum. In this case the whole of the drum must oscillate.

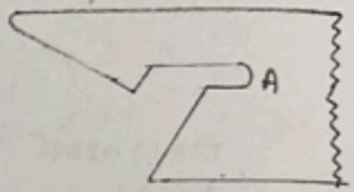


RAPIER HEADS:→

In Gabler system, the weft yarn is take to the middle of the shed by right hand rapier as a loop and then transferred to the left hand rapier as the two rapier heads overlaps in the middle of the shed. The weft yarn loop being under tension gets threaded through the spring loaded cover guide and gets trapped in the space C as the rapier retracts. Then left hand rapier is able to do the job of straightening the loop of weft yarn by sliding through the gap. Weft breaks occur more frequent weft is not gripped by the rapier: hand head so the dropped weft on transfer at the rapier heads. in the middle of the loom is eliminated.

GABLER SYSTEM.



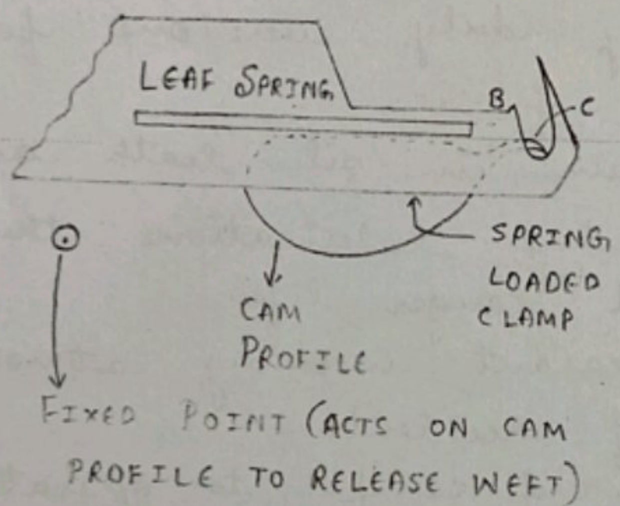


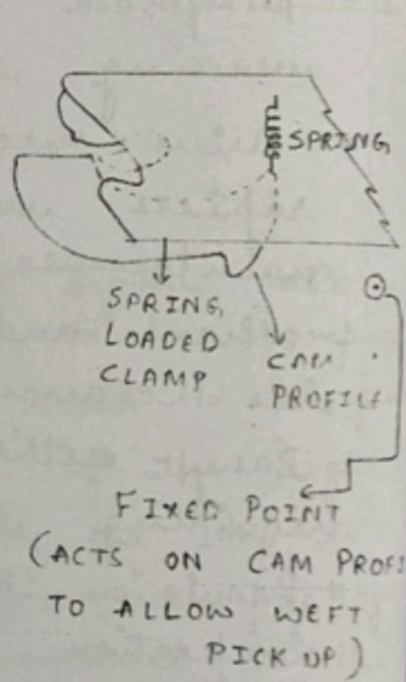
Rapier heads for Dewas system are intricate as the weft yarn has to be clamped. clamps are spring loaded and need to be opened at relevant positions. The clamp A of the right hand rapier head is opened by the stop to pick up and the weft yarn from the package and is closed as it starts movement to the left. The clamped yarn is taken to the left right hand rapier. In the middle the left and right hand rapiers make sideway overlap; the left hand rapier head positioning to catch the weft yarn in its hook. The yarn being clamped at c as it retracts.

Immediately the right rapier head clamp is opened to release the yarn. This helps in a smooth transition. The cam of the left hand rapier is opened at the exit to release the weft yarn after insertion. The back walls of the rapier are tapered to a point at their less defects.

- Less value loss due to almost eliminati of defects like missing picks, broken picks
- Easy supervision due to indicating conto systems.
- Easy in changing widths.
- Bigger size warp and cloth became more running time.
- Reinforced heavy duty versions for weaving dense fabric.
- Drive mechanism in oil bath and rapiers use dry lubrications. thus lesse maintainence and longer life.
- clean and pleasant working atmosphere, less chances of accidents.
- Easy setting and simple to operate requiring less training time.
- Provision of slow motion, drive for better inspection and setting.
- Loom design is made suitable for quick style change.
- Both warp and weft designs can be changed while the loom is in running.
- The size of rapier head is reduced there by leading to the reduction in shed height and low stress on warp.
- Power consumption have been reduced, selvedge waste is also reduced.
- There are electronically clamped coupled indiv drives for warp let off and cloth take up and adjustment of warp tension & weft density can be made even when the machine is in operatio

leading end to ensure that the rapier correctly enters and passes through the shed. The rapier heads must leave the shed when it is closed to enable the outside warp threads to trap the weft and prevent the weft tension release.





FEATURES OF RAPIER LOOMS :→

- Increase in rate of weft insertion upto 1400 mpm, speeds can be achieved upto 700 r/
- wider widths upto 5400 mm.
- combination of higher WIR, less noise, less wear and tear etc.
- Flexibility and applicability
- Pattern of colour selection upto 14 colours easily.
- Synchronised drive system which controls working of all mechanisms and hence

AIR JET LOOM.

PRINCIPLES OF WEFT INSERTION:→

In the fundamental version of air jet looms, the weft directly drawn from a cone is inserted into the warp shed by a jet nozzle with the help of compressed air. In this standard reed was used and there were no mechanism except a yarn brake for the weft. to control the length of weft insertion i every weaving cycle, with this arrangement it was possible to weave a simple cloth like handkerchief upto a max. width of 24 inch.

The basic version was then modified to introduce a series of air guides in the form of thin sectioned profiled metallic pieces arranged like the teeth of a comb. These air guides had a conical orifice which reconverged the air that was diffusing soon after leaving the air jet nozzle. This enables the blast of air to travel linearly over a greater length upto 60" with sufficient cohesive pressure on cotton yarns in the count range of 6's to 60's Ne the air guides naturally have been named as confusers.

FEATURES OF AIR JET LOOM:→

1. Reed Space – 150-400 cm
   Speed – 350-750 ppm
2. Weft insertion rate – 1600 mts/min.
3. Shedding – crank, ~~cam~~, cam, dobby or Jacquard

shed height - 65mm - 80mm.

4. Sley drive / seed motion - crank.

5. Weft insertion - Single or multijet with confuser with measuring roller and storage tube or drum feeder.

6. Compressed air supply - Dry, oil free of 6 bar pr

7. Weft stop motion - Optical motion.

8. Warp stop motion - Electrical

9. Warp mixer - 1/1 or 2/2 possible

10. Let off - [Hunt type / continuous automatically controlled]. Differential drive f twin beams provided.

11. Take up - Positive Continuous.

12. Pick - finding - Inching slow forward and backward.

13. Selvedge - Leno or hot melt ; with auxillary silk.

14. Main drive - Direct through V-rop

15. Operations - Push button, start, stop emergency. warp tension release & rese

16. Lubrication - Major components running oil bath, centralised & automatic

17. Electronic control - Microprocessor to control weft insertion timing, air pres functioning detected, signalling system.

18. Noise level - Less than 50 dB.

19 Fabric woven - cotton / blended spun and filament fabrics, poplin, taffeta, denims, fancy jets etc.

SYSTEMS OF JET WEAVING :→

1. With plain reed, confuser and main nozzle.
2. With plain reed, confuser guide, main nozzle and relay nozzle.
3. With profile reed, main nozzle and relay nozz
4. With plain reed, main nozzle, relay nozzle without confuser.

1. WITH PLAIN REED, CONFUSER AND MAIN NOZZLE:

Air has a tendency of dissipating area from the line of axis of nozzle, which is the path taken by the pick. As such yarn acceleration falls off rapidly beyond a short distance from the orifice which depends on the square of difference between air speed and yarn speed as the yarn gathers the speed. One way of reducing this effect is by means of multi ring constrictor by which a tunnel is formed which is completed by the presence of warp ends.

It is essential for the confuser to be fairly and closely spaced for better control of air dissipation and to minimize the level of abrasion between confuser and warp. The materia of confusers have been changed from metal to plastic to reduce the abrasion ~~resistance~~ level. The crosssectional shape of this guide is almost a complete circle, which requires a less air for the same rate of weft insertion than the open guides. It is most suitable for spun fabrics and fabrics with spun warp and filament weft.

2. PLAIN REED, CONFUSER GUIDE, MAIN AND RELAY NO[ZZLE]

The another way of preventing the air disi[pation] and imparting the proper acceleration of the w[eft] yarn is by using the subsidiary nozzles (sub nozzles) or relay nozzles placed at intervals acro[ss] the whole width of the warp. These nozzles operate in sequence on the loading section o[f] the pick. Most of the looms use plastic guid[es] which have smaller c/s area for air passage t[han] those with single nozzle loom. The relay nozzle[s] are placed between the guides at certain spacing and are activated intermittently in series from the weft supply side. The c/s area, shape and size of the opening from which the weft yarn is released are important parame[ters] in the designe of this type of control system. This system combines the closed air guide wit[h] a multinozzle concept and constituents on energy saving type insertion system suitable f[or] weaving wider spun fabrics and those with warp spun and filament weft.

3. PROFILE REED, MAIN NOZZLE AND RELAY NOZZLE

Relay nozzle helps the air stream and keep the weft yarn in a tunnel formed in the reed. Advantage of this system is the reduc[ed] level of abrasion between reed and warp compared with this systems using guides seperate from the reed. However high cost of t[he] reed is the limitation this system performs weft insertion by a combination of open air guides and several relay nozzle and is the most suitable weft insertion system. For all filament or combination fabrics with filament warp.

4. PLAIN REED, MAIN NOZZLE, RELAY NOZZLE AND WITHOUT CONFUSERS.

In this system, newly developed relay nozzle are used, which have two nozzle holes seperated by a vertical distance. Weft yarn is transported through warp shed in between the two holes and closer to the reed. Under specific cond. two jets from two holes centralize the weft. Its scope is limited since utilisation of air jet velocity for weft insertion will be undoubtly less than that of with the other systems of weft insertions using ~~other~~ air guides.

WARP PREPARATION FOR AIR JET LOOM :→

As the weft is pushed across the shed by means of air. The necessity to form a very clear shed arises. If there is any slack warp in the warp sheet, it can obstruct the weaving of weft and cause a short pick. For this reason, the warping and sizing holds the key for efficient weaving.

Warping is the first process of ~~inserting~~ converting individual ends into sheet. Errors at this stage, ~~will~~ are found at sizing and weaving. The goal at warping should be "no lost ends". Hence it is essential to ensure the following in warping and sizing [~~holds the key~~ for] apart from the top quality yarn package.

a). Winding tension should be uniform.

b). In the warping creel, the cone allignment sh be checked periodically. Any warp breaks shoul be knotted to avoid lappers in sizing.

c) For sizing, a multicylinder sizing machine will be essential with graduated temperature control during cylindere.

d) Split drying, wet splitting double size box. a after waxing unit will improve quality of the warp.

e) Stretch in sizing should be as low as possib

f) The warp and weft should have uniform w tension and sibbonless.

g). The package should be as hard as possible with 5° 57' taper preferably.

h) The warp yarn have higher elongation at l which will help in meeting the rapid cyclic warp tension variation. In fact elongation charact tics are more critical than the strength and CSP characteristics.

WEFT PREPARATION FOR AIR JET LOOM:→.

If the weft package meant for air jet looms are not properly prepared with uniform tension and hard packing density. Problem will arise during unwinding of the package on loo such as:

a) Sloughing off

b) Snarling

c) Excessive tension

d) Too many weft breakages.

1] In winding more the elasticity left in the yarn the better it runs on the loom. In case the tension weights employed at cone winding should not exceed 10-15% of single thread strengt

2]. The RH in winding department should be 60-6 and temperature 70-72°F for good winding conditio

3]. Firmer the package the better it runs off in th airjet looms. The larger the angle of wind, the firmer the package that can be wound.

4]. The 6" traverse and 2° cone are recommended for 24^s count and 6" traverse and 3°51' cones for count finer than 24^s.

5]. As yarn tension increases rapidly when unwind small packages dia, it is advisable to have a inside core dia of 4".

6] Ribboning must be minimised and weak spo in the yarn should be removed.

7] Knots testers are good detectors to slip knots.

8] Electronic clearers are to be preferred for prepari weft for air jet looms as every fault tha escapes is a potential source of fabric defects weft breakage.

9] Transfer tails should be carefully position on the cone and its length should be uniform

WATER JET LOOM

1. INTRODUCTION:→

A successful method of waterjet ~~loom~~ weft insertion was invented by Svaty, a Czechoslovakian engineer, and more than 150 water jet looms had been working there by 1959. These looms were producing fabrics of 42" width from synthetic filament yarns, mainly nylon, at a rate of 350 PPM with a η of 80%.

Besides speed, the other (important) important features of these loom were their smooth running, noiseless and absence of old systems of picking. The basic physical principle and the main design features of this loom are quite different from those of a conventional loom.

✓ 2. DIFFERENCE BETWEEN AIRJET AND WATERJET:→

Waterjet looms are similar in many ways to airjet looms but they differs in construction, operating conditions and performance.

i) Warp and weft yarns must be hydrophobic in nature. Thermoplastic yarns. Eg: Nylon, PET, PP, glass, acetate etc are used. When warps are sized, it must be water insensitive sizes like acrylic ester size.

ii) All the m/c parts that get wet must be resistant to corrosion. Basic machine can be built in mild steel with a protective water-proof spray paint.

Eg:
Heald frames - Al.
Wire heald and reed - stainless steel
Nuts and bolts - stainless steel or brass

Temple rings :- Rubber

iii). Thermoplastic yarns offer the advantages of severance of weft by a heated blades and the provision of a heat selvedge by fusing.

iv) Although no compressor is required as with air jet weaving machine, each water jet loom is provided with its own miniature pump to feed water under pressure to the nozzle.

To get the best results, it is important that the water used doesn't scale, rust or erode the high precision components of the m/c.

3. REQUIREMENTS OF WATER JET LOOMS :→

a) Purified water

b) Operating temp. → 16-24°c

c) Pressure → 0.5-1.5 kgs/cm²

d) Energy → 0.4-0.5 gms/mt/pick.

4. CONTENTS OF WATER :→

TURBID WATER. →

contains organic <plants etc> and inorganic <salt, rocks> compounds, which creates problems of scaling, rusting, damaging the pump cylinder, nozzle etc.

PH → contains hydrogen ion concentration, problems of erosion and rusting by heavy acid and heavy alkaline water. PH must be neutral- 7 pH.

HARDNESS →

Water contains soluble salts and of calcium and magnesium. This gives problems of scaling at the cutters.

PLUS IONS :→

contains iron and magnesium compounds which gives scaling.

MINUS IONS →

contains free chlorine which causes problems of erosion.

So it is necessary that water must be demineralised by a water treatment plant where the conductivity of water is the main indicator of the efficiency of the

DIMINERALISATION PLANT [DM].

The pure water has '0' conductivity. Filter of water is necessary since even partial clogging can lead to short picks. Normally DM plant is 3-Bed plant.

5. WEFT INSERTION SYSTEM :→

Since the weft is inserted by a water jet the flying stability of the weft inserted depends ~~on~~ upon the following factors :→

i). The amount of water jetted.
ii) The (~~pressure~~) pressure under which water is jetted
iii) The c/s of nozzle at the time of jetting.
iv) The timing of cramper opening and closing with respect to the water jetting angle;
v) The measuring length of yarn;
vi) The position of the nozzle i.e. the direction of flight.

6. MECHANISM OF WATER JET LOOM:

The Sulzer water jet loom does not differ principle from a conventional loom, apart from the method of weft insertion.

WARP BEAM:

The warp beam is of conventional size. It is mounted considerably higher than on the conventional loom. The warp passes over a spring loaded roller, which takes the place of the back roller in a conventional loom. This roller represents the highest point, in the whole loom structure. Between the roller and the cloth fell, the warp is inclined downward at an angle of 36° to the horizontal. It is: easily accessible from the loom front to attend to a warp break. The loom is very compact.

SHEDDING:

(i) It is produced by cam motion. The healdshafts move at almost right angles to the warp line. i.e. at an angle of 36° to the vertical. The picking operation is carried out in a fully open sh

(ii) The weaves produced in the waterjet loom include plains, voiles, taffetas, hopsack twills and crepes and the count range from 10 to 120 denier. Nylon, terylene, glass, filament yarns r also woven. The max. weight of the fabric produced so far is about 185 gms/sq. mt. The max. no. of dents/inc in the reed is only 76.

BEAT - UP →

The beat up is carried out by a crank driven sley. The sley is considerably lighter than that of the conventional loom. The direction of the beat-up corresponds to the downward (rear) slope of the warp line.

TAKE - UP MOTION :→

This water jet loom has a conventional +ve take up motion.

LET- OFF MOTION :→

The -ve friction type let off motion is used. The slopping warp line same floor space

SELVEDGE MOTION →.

Leno selvedge is formed.

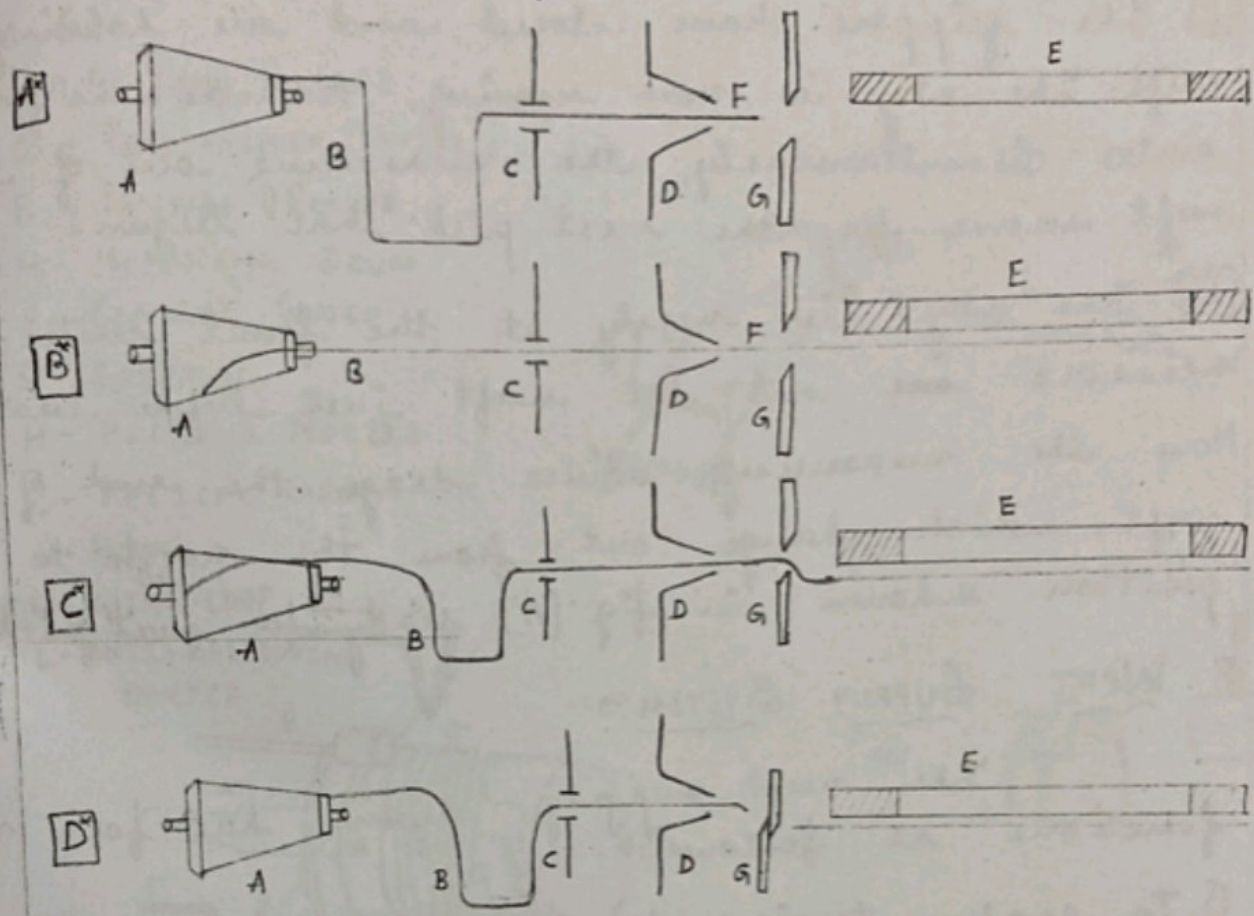
7. STAGES OF WEFT INSERTION :→

The weft supply in the form of a cone bobbin is situated at the LHS of the water jet loome. Large packages of cone which hold 8-9 lbs of yarn. are used for weft supply

From the cone or weft supply package the weft passes through a tension device, which unwinds a reserve of yarn sufficient for one pick at each loom cycle. This reserve is shown in the fig. by a loop of yarn B.

The weft insertion media is water with high pressure. The water is injected through a small jet and carries a weft thread through the warp shed. Consumption of water is 24-28 lit or 0.5 cc/pick and it depends on the fabric width

The four main stages of weft insertion in the Swaty water jet loom are as shown:→



[A] The sley is approaching to the back centre. The weft reserve has already been wound, the grippers and the scissors are open and a short length of weft hangs out of the nozzle. Hydraulic picking starts when the sley is nearly at back centre.

[B] The sley is almost all the back centre. The weft on the measuring ~~laser~~ device is free and a pump forces water into the nozzle. A fine jet of water is projected into the warp shed and the weft comes to a halt when the reserve is exhausted. When the weft comes to ~~the~~ rest, its leading end projects several cms beyond the right hand selvedge.

[C] The grippers have closed and are holding the weft. The sley is now moving towards the front centre. Simultaneously the measuring out of the weft reserve for the next pick has begun.

[D] The sley is nearly at the front centre. The scissors ~~are~~ cut the weft just before beat-up. Now the measuring device drags the end of the weft, which hangs out from the nozzle to position shown in fig [A] ready for next pick.

8. WEFT SUPPLY SYSTEM :→

The weft supply system has four main functions as follows :→

i) To apply tension to the weft before it is wound onto the measuring device;

ii) To measure the required weft reserve for each pick;

iii) To apply tension to the weft during weaving

iv) To pull the protruding end of the weft back into the nozzle after cutting by scissors

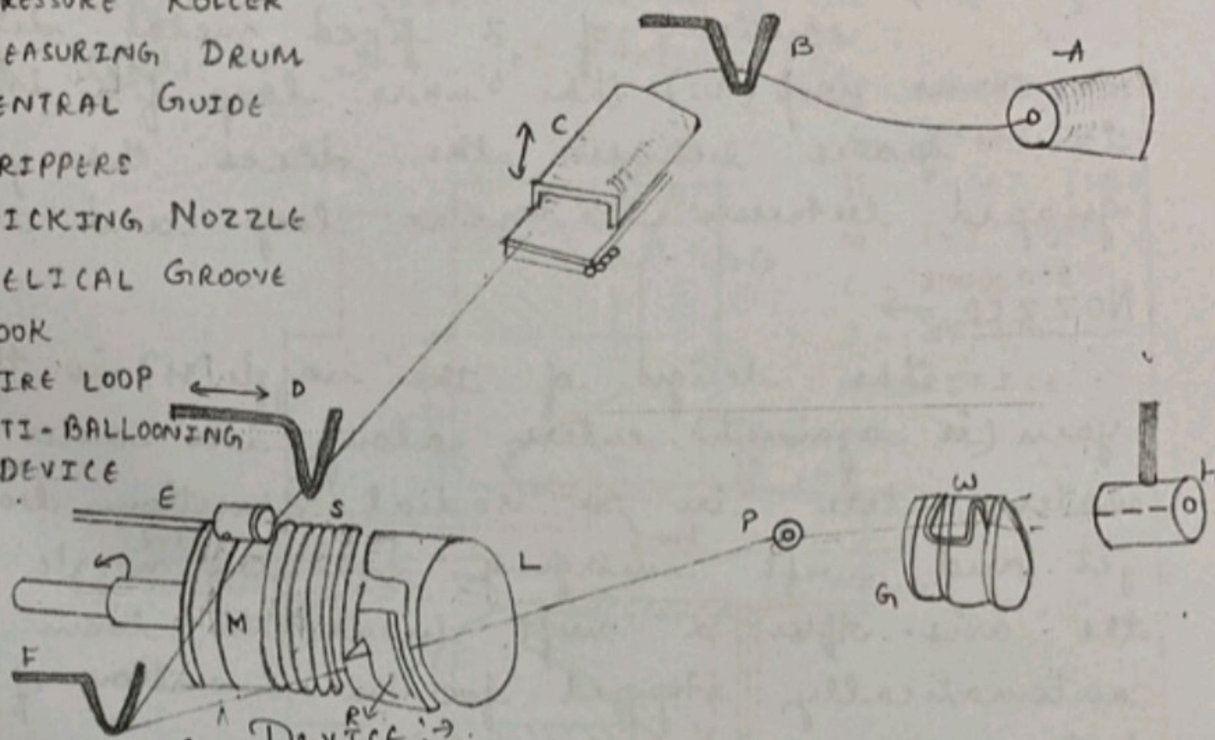
A schematic diagram, illustrating the weft supply system, is shown in the diagram in next page.

In the fig, the weft yarn passes from the cone (A), over a guide (B) through the tensioning device (C), over a measuring drum (M). From the measuring drum, the weft passes through the centre guide (P) and the grippers (G) to the picking nozzle (H)

The yarn wound on the measuring drum

is deposited in the helical groove(s).

A - CONE
B, D, F - YARN GUIDES
C - TENSIONING DEVICE
E - PRESSURE ROLLER
M - MEASURING DRUM
P - CENTRAL GUIDE
G - GRIPPERS
H - PICKING NOZZLE
S - HELICAL GROOVE
R - HOOK
W - WIRE LOOP
L - ANTI-BALLOONING DEVICE



TENSIONING DEVICE :→

The tensioning device (c) consists of a series of light metal pins which are attracted towards a disc by a permanent magnet. The weft yarn passes between the pins and the disc and is thus, gripped in a no. of places. It produces a uniform yarn tension at the high withdrawal speed of the loom.

MEASURING DEVICE :→

The device consists of a measuring drum (M), part of the surface of which is smooth and against which is preferred a pressure roller (E). The remainder of the drum surface is machined with a helical grooved (S), while the front of the drum carries a hook (R). The measuring drum is covered by a casing which acts as an anti-ballooning device (L) during the unwinding of the yarn from the drum.

GRIPPERS (G) →

consists of 3 fixed metal discs and a wire loop (W). The wire loop fits into the 2 inter-spaces between the discs. The yarn is gripped between the wire loop and the disce.

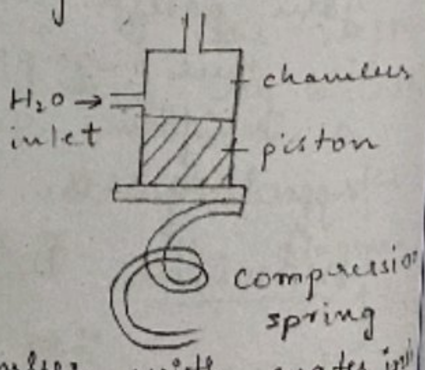
NOZZLE →

The design of the nozzle (H) is that the yarn (~~is against~~) enters along its axis, while the water enters in a radial direction, both water jet and weft emerging from the nozzle along the axis. After a weft break, the loom is automatically stopped for the insertion of the weft into the nozzle.

9. PICKING SYSTEM :→

The picking mechanism of the water jet loom consists of 3 main parts,

1) The pump,
2) The throttle valve
3) The water jet nozzle



1) PUMP →

The pump has a chamber with water inlet and piston. Piston is controlled by cam.

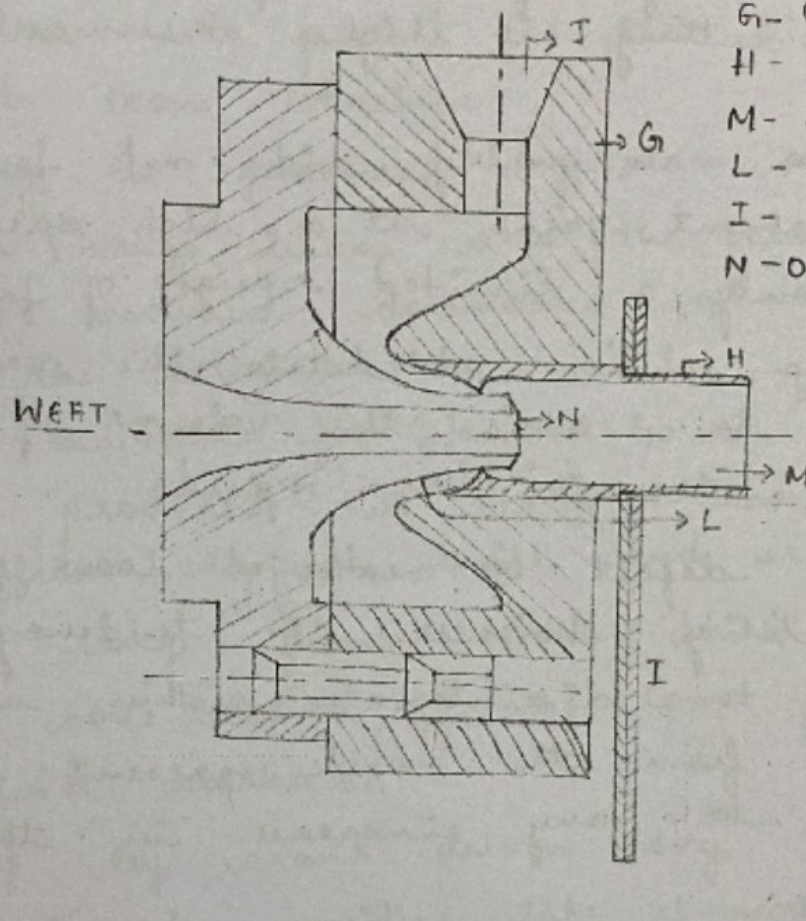
2) THROTTLE VALVE →.

The throttle valve placed above the chamber has a manual screw adjustment. This screw adjusts the volume of water used / pick.

3). NOZZLE →

The nozzle consists of a casing (G) which contains an annual water chamber and a radial water inlet (J). The yarn enters the nozzle by a tapered channel ending in the orifice (N), which leads to the jet tube (M)

J - WATER INLET
G - CASING
H - INSET TUBE
M - JET TUBE
L - SHOULDER
I - SPRING
N - ORIFICE



The inner wall of the jet tube consists of a tight fitting but mobile inset tube (H), which is pressed against a shoulder (L) by a spring (I). Thus closes the annual chamber against the jet tube. The presence of spring (I) can be adjusted by means of a set-screw and this screw adjust the speed of water jet emerging from the nozzle.

10. CONCLUSION:

(i) The water jet insertion of the weft is noiseless and the loom is smooth-running.

(ii) Advantage include elimination of pirn winding and a saving of floor space.

(iii) The wastage of the weft material due to selvedge cutting is higher than on a conventional loom.

(iv) It is reasonably wide m/c for weaving fine filament yarns at a high speed but can weave only a limited range of fabrics.

(v) A soap solution added to the water makes it possible to reduce the volume of water without reducing the picking speed.

(vi). Main defect of waterjet loom is its lack of versatility. Moreover, the tendency of the waterjet to disintegrate within a certain distance from the nozzle present a major obstacle to any increase in the width of loom.

NOTE :→

The weft insertion by waterjet can carry cotton yarns more easily than synthetic fibres, but its practical application is confined to synthetic fibres. This is because of the problem of sizing of cotton yarns and of wet strength and with the necessity of a perfectly clear shed free from ~~(protucing)~~ protruding fibres and entanglements, special sizes, which are not affected by water, have been developed but these are expensive, hence have very limited use. The loom therefore, weaves warps which do not require size and which are not weakened by wetting. Hence, the greater part of products from waterjet looms consists of nylon, voiles and taffetas.

SALIENT FEATURES OF WATER JET LOOMS:

1. Warp beam is present at the highest point in the whole loom structure.
2. Shedding is produced by cam motion.
3. Between warp beam and the cloth fell, the warp is inclined downward at an angle of 36° to the horizontal.
4. Mostly suitable for filament yarns.
5. Weaves produced in waterjet loom includes plain voile, taffetas, hopsack, twill and crapes.
6. Count range from 10 to 120 denier.
7. Light construction of the loom prevents weaving of heavier cloths.
8. Beat up by crank driven sley.
9. Conventional positive take up motion.
10. Negative friction type let off motion.
11. Conventional leno and fused selvedge.
12. Speed of 350 ppm.
13. Reed width are 100 cm to 200 cm.
14. Limited in colour range.

Projectile Loom.

Types of Weft Supply Creel :→

On the projectile weaving machines the weft is unwound with a high acceleration and it, is therefore, important that minimum resistance is added to it on the passage. To this effect the of the ~~end~~ weft supply cross wound package lie in radial straight lines, the centre of which is the compensator eyelet, which assumes the operating position during the gripper projectile flight. The creel has a fan like shape in plane view. The cross-wound package are creeled on tilting holders to enable easy change.

The package covers, designed to suppress ballooning of the weft yarn are of transparent plastic. Such covers are preferred of metal covers because they are transparent and, moreover, due to effect of the static electricity provide better balloon breaking.

Preferably pot shaped covers are used because they give better balloon control and hinder the snarling of the weft thread. In filament weaving the supply bobbins are better put up vertically. The yarn layers, which ocassionally may slip down, are retained by a felt pad.

When coarser weft is used it is better to use magazined supply package for each colour. The weft tail of the upper cone is pieced up with the starting end of the reserve cone. In this instance compartment pkg covers are used:

TYPES OF WEFT TENSIONING DEVICES:→

The weft must be inserted in the shed properly tensioned. To this effect it is braked by a tensioner when unwound from the supply package. The principle performance factors of weft tensioner are:→

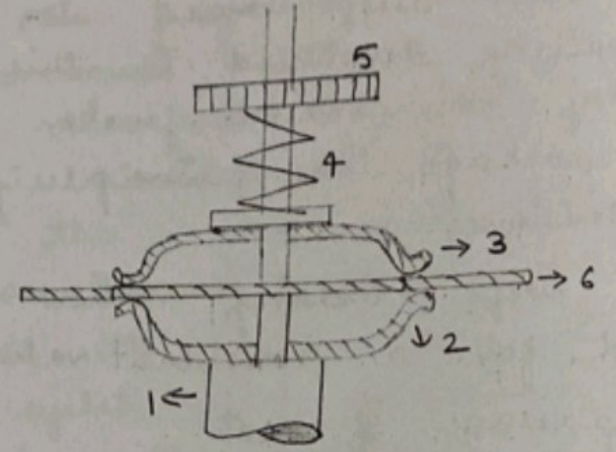
1) Uniform weft braking motion which can be adjusted for a constant value.
2) Free passage of knot.
3) The moving part of the tensioner must as possible as to respond readily to irregularities in the weft yarn.
4). The tensioner must be as far as possible from the weft carrier at the ready position so that the impact weft tensions, caused by the knot passage which are distribute across a large length.
5) Moreover, on some types of weaving m/c, the weft braking efficiency is programme controlled. The braking may be released mechanically by a cam, or by lever and draw bare. The mechanically operated tensione control is rather a complicated matter. On the other hand, the electromagnetic tensioner control is simple and permits operation by remote control.

THE MAIN TYPES OF TENSIONERS ARE:

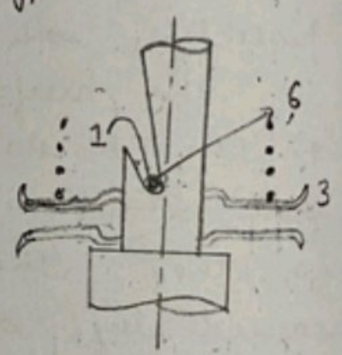
1. MECHANICAL WEFT TENSIONER:

a) The standard plate tensioner

These are not suitable because a pass knot cause the thread (56) to be deflected to H circumference or to slip out of the tensioner

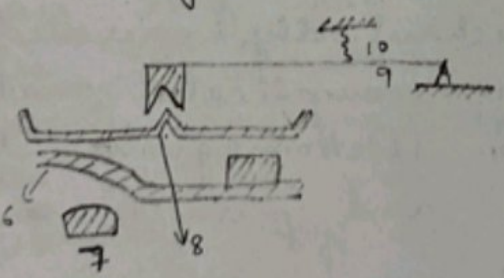


b). Improved Plate tensioner type snoeck:→



This is shown in fig. supporting pin 1 is provided with a slot 6 (and) to recieve weft thread. Due to this weft thread can't slip out of the tensioner. The weft is easily threaded in the tensioner by lifting upper plate 3. The plate of this tensioner do not rotate so that the tensioner is easily filled with textile dust.

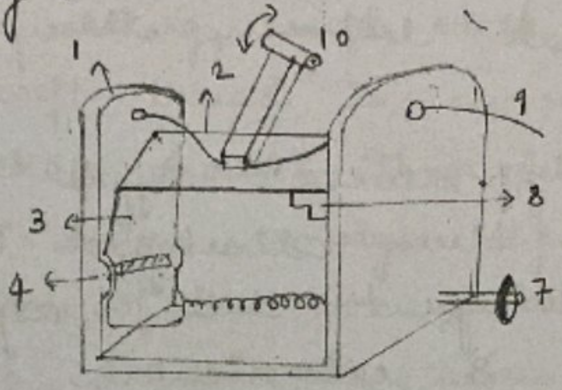
c) The ring tensioner:→ This is used with SACM weaving machine. Weft 6 is threaded in ceramic ring 7. and braked., on the outlet. by the plate 8, which is loaded with spring 10 via lever 9.



< For rapier, not required for projectile >

ELECTROMAGNETIC TYPE:→

a) Tape tensioner:→ This is shown in fig. tape steel tape 2 is fixed with angle iron B to frame the other end of steel tape 2 is riveted to arm 3, which is pivoted on pin 4 and pulle by spring 5.



Weft thread 9 passing through the ceramic eyes in the frames, is pressed on the steel tape by lever 10, whose operating surface is lined with plastic. The braking efficiency is adjusted by changing the torque M and pretensioning the spring 5 with tightening the screw 6 and regulating nut 7. The weft brakin may be programme controlled in dependence on the weft carrier path by cam mechanism which operates lever 10, or by means of an electrom

WEFT FEED SYSTEM :→

The weft feed system must meet the following requirement :→

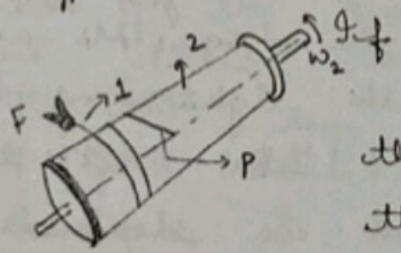
1) During the unwinding from the supply package, a minimum tension, free of impact, m be applied to the weft thread.

2) The system must allow an easy withdrawa of the prepared weft supply.

3) The passage of the weft thread through the weft accumulator must be smooth and continuous to allow an easy rethreading wh the weft break between the package and accumulator.

Gradually several types of weft accumul systems have been developed. They may be divided according to their respective design concept into 3 categories:

1) The feed is controlled by the picking tension of weft thread. The feed system does not form a weft reserve. The simplest mechani of this type is shown in fig. A cylindrical or slightly conical drum 2 ~~to~~ rotates at constant speed.



If there is no tension F applie to weft 1 at the picking side, the weft thread slips through on the smooth drum surface. The tension F, which is present in the weft at the start of the pick produces the friction force P. This feed system supplies always the same length of the weft thread as was unwound for each pick.

2) The feed is controlled by photoelectric cell The feed system forms a weft reserve.

a) In this, weft is fed through the axis of a conical drum which perform the function of a flyer winding the weft thread on the stationar conical drum. The weft reserve is checked by photoelectric cell. Stationary ring ~~(produces)~~ provides nylon bristles on its inner side, hinder the ballooning during the weft withdrawal.

b) Except the above method, the accumulators, with a travelling weft stock is also used. In this, the weft thread is unwound from a cross-wound package, passes through stationary eye and is wound onto conveyor tapes which moves in the direction of the accumulator axis, The conveyo tapes are driven by worm gearing. The weft accumulator, consisting of body, tapes and ring is rotated. On the outlet side, the weft thread is withdrawn behind eye by the weft carrier. The weft unwinding from the accumulator is cassisted by traveller racing on ring as on the ring spinning m/c.

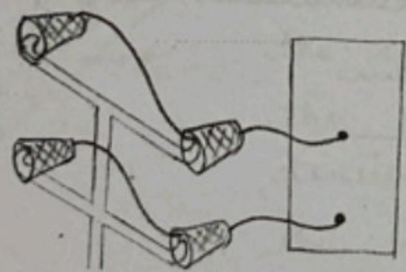
3). The weft type box accumulator system which is not used for projectile loom.

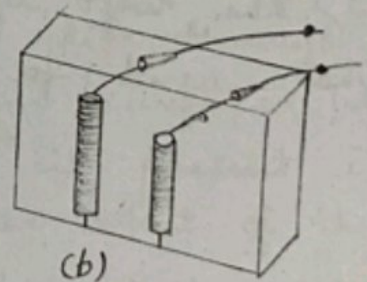
—x —— x——

RAPIER LOOM.

TYPES OF WEFT SUPPLY (SYSTEM) CREEL :->

On the rapier weaving machine, the weft start and run out occur slowly a low acceleration. Due to this the weft path may be more complicated and may contain several point, in which the weft has to overcome to a higher resistance. It is therefore, possible to use different types of weft supply package and to arrange them in different ways in creels of the rapier weaving machine. in tandem, one behind the other, superimposed etc. For the same reason, weaving with more than 4 colours does not present any problem on the rapier weaving machine. The weft supply package may be arranged in two superimposed rows as shown in fig.(a)


(a)


(b)

The rapier weaving machine may process weft yarn of lower strength, fancy yarns and other special weft yarn with regard to the high consumption of the coarse weft yarn, it is advantageous to use the ~~most)~~ rocket supply bobbin 660 mm long and longer as shown in fig (b)

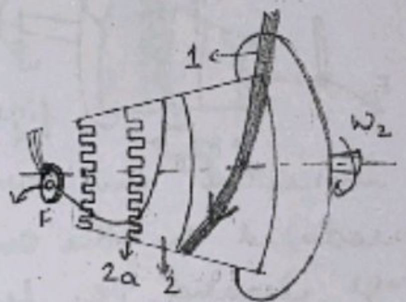
Except this combined creel is also used. The finer weft yarn which are less frequently used within the weave repeat are supplied from cross wound cones above, while the coarser weft yarns and the weft threads which are frequently used within the pattern repeat are unwound from rocket bobbins below. The entire creel consists of individual stands which are placed close to the machine.

TYPES OF WEFT TENSIONING DEVICE :→

Same that described in projectile loom.

WEFT FEED SYSTEM :→

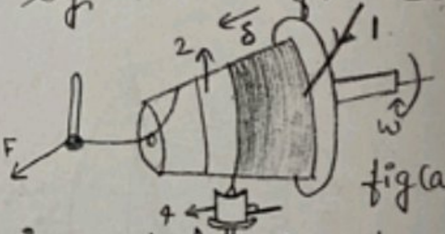
1) Feed is controlled by picking tension of the weft thread. The feed system doesn't form a weft reserve. The rapier weaving machine is equipped with the weft accumulator is shown in fig.



Drum 2 rotates at a constant speed, it is tapered to allow the coils of weft 1 to move towards the drum apex. When the weft is withdrawn from the picking side F, one of the six claws 2a seizes the last weft coil and the feeder unwinds a new yarn length from the supply package. If there is no weft tension present in eyelet after completion of the pick, the last weft coil on the drum is released from the groove and the drum slips through under the weft thread.

2) The feed is controlled by photoelectric cell. The feed system forms a weft reserve. The SAVI accumulator is shown in fig(a). Accumulator drum 2 is slightly tapered so that the coils of weft 1,

deposited always in the same place, can move axially in the direction of 8. The amount of the weft reserve is checked by photoelectric cell 4. When the reflection surface of the drum is covered by weft coils, the photoelectric cell switches off the electric drive of the drum. A control ring, fitted above the outlet side of the drum, hinders the ballooning of the withdrawn weft threads during picking. The total weft reserve on the drum is always larger than the weft consumption per one pick. The required picking length of the weft is withdrawn from the drum by the weft carrier.



fig(a).

TYPES OF SELVEDGES :-

1) FOR GABLER SYSTEM :

In the weft is inserted in two picks, so the loop selvedge is produced on the one side and the other side the fringe bound, i.e. leno selvedge by special binder card. Though the warp shed changes after each pick, the weft is laid in cycle of two picks, with a hairpin-shaped loop. Thus one side selvedge is perfectly normal in construction smooth and uniform. The other side all the weft ends are open. These open weft ends are bound with seperate selvedge cords or yarn by a seperate binder mechanism. After binding, the projecting picks are sheared or trimmed to produce a relatively smooth selvedge

2) FOR DEWAS SYSTEM :

Selvedges are formed by a simple patent leno device ensuring an efficient locking of each pick. This arrangement imparts the selvedge sufficient strength to support the powerful finishing treatments. The cutting of the fringes on the loom itself remaining after insertion gives ~~on~~ the selvedges clean and regular appearence. Six threads bind a selvedge, 3 for the cloth selvedge and 3 for binding the waste weft ends. Except these the tuck in selvedge is also formed

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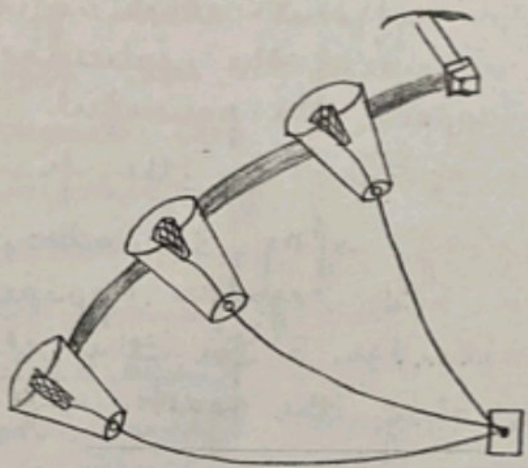
AIR JET LOOM.

TYPES OF WEFT SUPPLY CREEL:

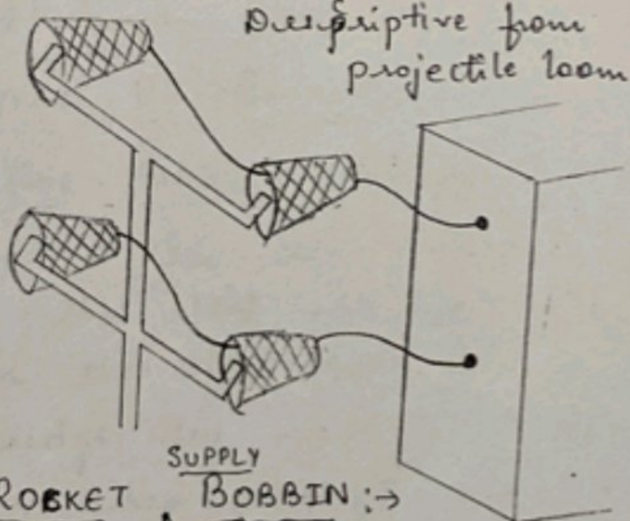
1) CREEL WITH FAN LIKE SHAPE:→

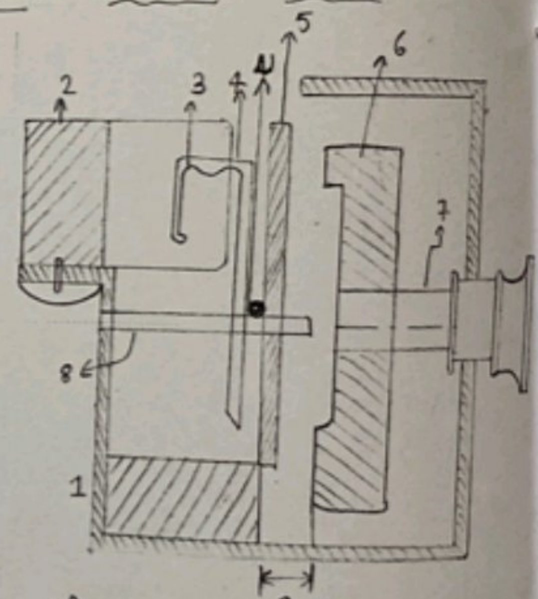


Descriptive from projectile loom.

2) SUPER IMPOSED OR MAGAZINED SUPPLY CREEL:→

Descriptive from projectile loom





Tensioner with permanent magnet

3) ROCKET SUPPLY BOBBIN:→

From rapier loom.

WEFT TENSIONING DEVICE:

All the weft tensioner described above may be used in these loom but most common tensioner which is used is,

TENSIONER WITH PERMANENT MAGNET:→

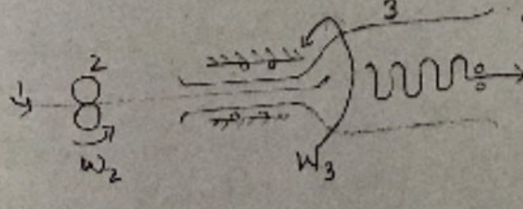
The cross section of this magnetic tensioner is shown in fig. Fixed to frame 1 is body 2 and suspended from the body pin 3 are six braking steel wires 4. The weft thread U is placed between the braking wires 4 and glass plates 5. The air gap between the permanent magnet 6 and braking steel wires 4 and consequently, the weft braking efficiency are adjusted by means of screw 7. Vertically, the weft thread is guided by steel rods 8. In this arrangement the weft thread is braked by twelve rods and which operates independently and give, therefore a uniform braking effect.

WEFT FEED SYSTEM:->

A box type weft ~~(accumlator)~~ accumulator systems is used several such systems are known from the patent literature.

a) A stationary cylindrical box is filled from one side by means of a jet with the weft thread. The weft thread is randomly deposited in layer insid the box. At the other side of the box it is withdrawn with a very low resistance. The amount of weft inside the box can be controlled by mea of a level gause.

b) The other is rotary box which is shown in fig. weft thread 1 is fed by rotating rollers 2. into box 3 where it is deposited by the action of centrifugal forces. The weft length may be controlled with some precision by rollers 2 and a tensioner fitte at the outlet side of the box



DIFFERENT CARRIER BREAKING SYSTEM:

1) For Projectile, Air jet and waterjet:

To ensure that the single picks are inserted, the weft should be cut at the picking side of the loom. As the left of weft fed per pick is in excess of the cloth-width, the weft must also be cut at the recieving sides to produce a short fringe. A pair of cutting blades are, therefore placed at both selvedge with the cutting edges about 1/4" of weft cut per pick and removed as waste by suction nozzle to be deposited in a collecting bage. For thermoplastic yarns, electrical heaters are used to cut the weft.

For single pick rapiers same system is used.

WEFT MIXING FOR PROJECTILE LOOMS:

In projectile loom, we can weave with two or four colours of weft. The following points are concerned for weft mixing:

1) SELECTOR MECHANISM :→

a) Originally projectile loom was weaving a plain cloth. But at present a selector mechanism is invented for weaving 4 colours, counts or qualities of weft and also pick and pick.

b) The problem of weaving at high speeds with 4 colours is difficult to solve. The magazine becomes most complex and expensive to load. This applies to both circular and column magazine. The former requires care in plugging and in the latter it is difficult to convey the bobbin from the column under the arc of the transfer hammer.

2) ZIG ZAG COLUMN MAGAZINE:

The above difficulties are overcome using a zig-zag column magazine with one colour/column, and using tip-bunches so that finding and location of the weft end by the battery filler is not necessary. The difficulties a not only on the magazine side. On the drop box side, large masses are moved at high speed and the change from box No. 1 to box No. 4 can't be made at single shuttle running speed. The control of weft also presents problems with certain qualities.

3) GRIPPER :→

The gripper principle is basically ideal for multicolour and pick-and pick weaving. The picking cycle shows that picks are introduced singly from one side. If 4 shuttle feeders, brakes, tensioners could be used, one set for each colour, pick and pick four colour weaving would be relatively simple. The problem is to accomodate the necessary mechanism in the available space.

4) GENEVA MOTION :→

For multi colour weft weaving, it is found that the four-bowl Geneva motion is the best mechanical solution to the box weaving problems. A no. of check weaving problems have also been solved by the adaption of the shuttleless principle of weft insertion.

WEFT MIXING FOR RAPIER:→

In rigid rapier, we can weave with to 16 colours of weft while in flexible rapier, we can weave upto 8 colour of weft yarn. For 8 colour spanish rapier loom the following mechanism is used:→

A single crank operated rapier is used in this loom to insert a pick through the shed. The weft is supplied to the rapier mechanism at the either side of the loom, from 8 pairs of magazinized cones of 8 colours. The weft ends from these cones pass through a set of guiders. Any one of the ends may be lowered by the selector mechanism to present to the nipper on the carrier end for weft insertion. The weft is inserted through the shed without any strain.

The MAV flying rapier loom can be equipped with a special mechanisms to weave either several colours or yarns of various materia. This contrivance is composed of guiding finger or per colour or per material selected either by dobby or a jacquard or by selection mechanism. The insertion of different weft can be effected in any order and in odd picks, that is pick and pick.

—— x —— x ——