Industrial garment machinery

Fashion Technology

III Semester

The main types of stitching machinery

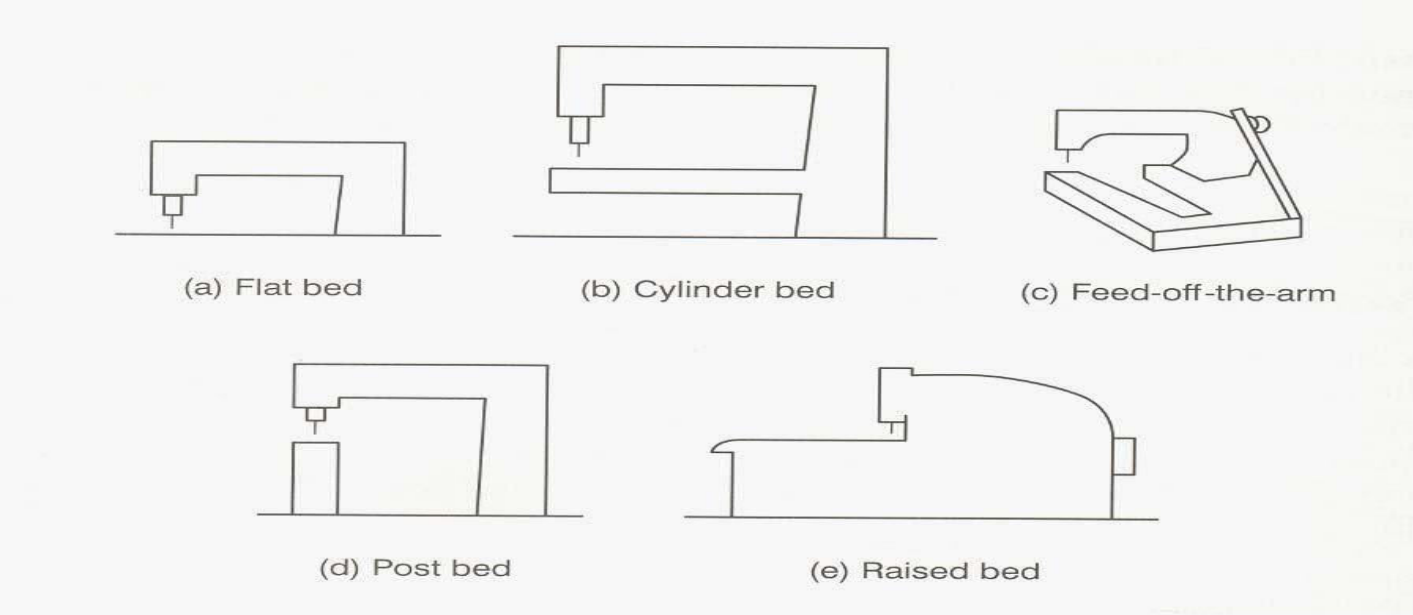
- The main types of stitching machinery and their uses in garment assembly (industrial setup)
- The stitching machinery can be studied on different basis as follows:
  - On the basis of type of stitch
  - On the basis of type of specialised function
  - On the basis of type of machine bed
  - On the basis of source of power
  - On the basis of level of automation
  - On the basis of number of needles
  - On the basis of programmability

- On the basis of types of stitch machinery can be classified as –
  - Lock stitch machines (which sew class 300 stitches)
  - Chain stitch machines (which sew class 100 and 400 stitches)
  - Overlock stitch machines (which sew class 500 stitches)
  - Covering stitch machines (which sew class 600 stitches)
  - Hand like stitch machines (which sew class 200 stitches)

- On the basis of type of specialised function the machinery can be classified on the name of special function or task they perform. These type of machines are generally perform one unique task but with high precision and great efficiency. The examples are as follow:
  - Pocket sewer
  - Pocket decorative machine
  - Pocket hemmer
  - Welt pocket setter
  - Button sewer
  - Buttonhole machine
  - Keyhole machine
  - Loop maker

- Bartack machine
- Pattern sewer
- Bottom hemmer
- Waistband sewer
- Blind stitch machine
- Button wrapper
- Bobbin elastic machine
- Embroidery machine
- Edge cutter
- Loop attacher ,etc

- On the basis of type of machine bed the machinery can be studied as following:
  - For more specialized garments and those made in higher volume, variations in machine shape are available which enables easier movement of the materials around the machine.



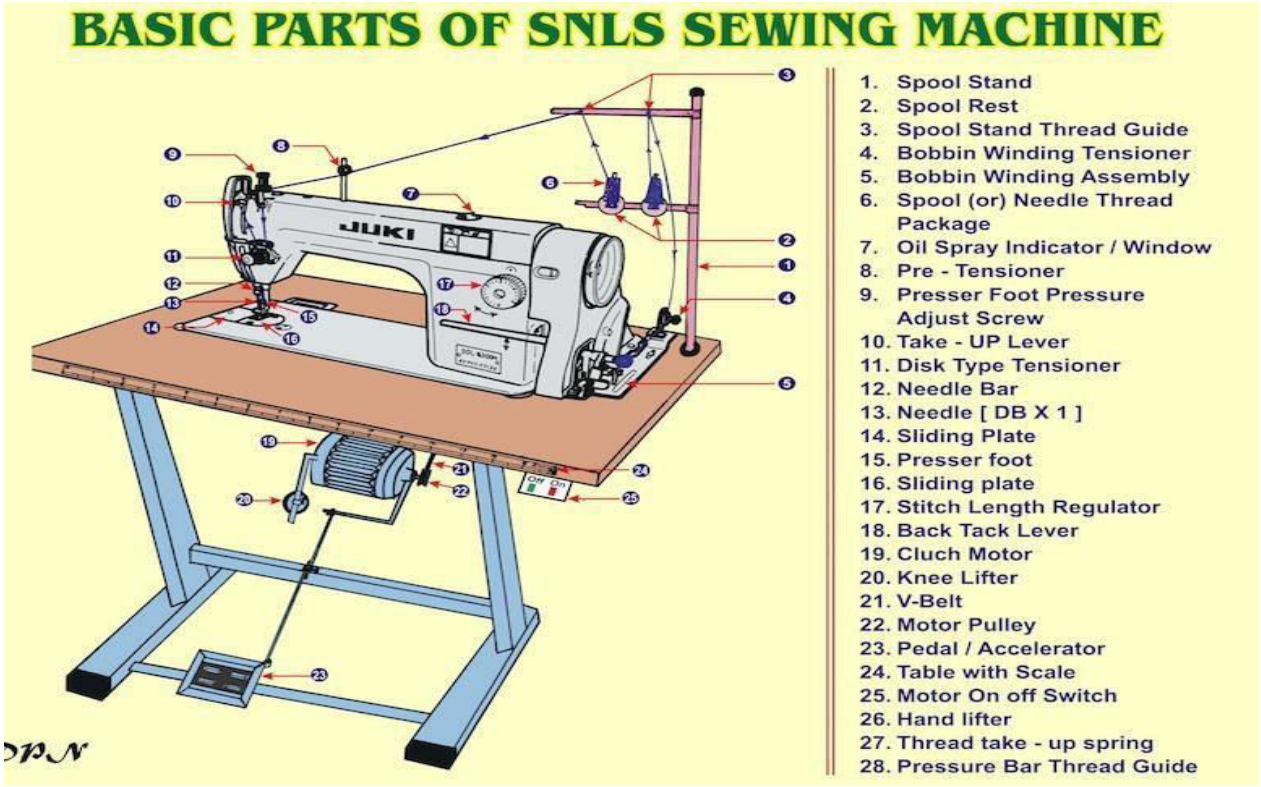
Types of Sewing Machine	Stitch Type	Features and Uses
Flat bed machine (basis type)	Lockstitch, Chain stitch	The large working area allows a wide range of application; the material can easily be guided around the needle and the presser foot. This basic type is used for all kinds of flat sewing work.
Raised bed machine	Lockstitch, Chain stitch	The bedplate is in the form of a plinth. It facilitates the assembly of pre-sewn parts and is especially suitable for the fitting of accessories and special attachments. This is the basic form for various specialized machines such as buttonholers.
Post bed machine	Lockstitch, Chain stitch	This type has an increased working height Special applications are found in the working of three-dimensional products. The post bed makes it easier to work on tight curves and corners, to sew in sleeves and to complete large, half-assembled products.

Cylinder bed machine	Lockstitch, Chain stitch	This type has an increased working height and a bed in the shape of a horizontal arm. It is especially suitable for working on tubular parts, such as cuffs, sleeves, and trouser legs, and also for button sewing and bar tacking. It is used extensively in the making of clothing from knitted fabrics.
Side bed machine	Chain stitch, Over-edge	Machines which are specialized for sewing at edges need only a small working area
Feed off the arm	Back rise, In seam machines	The feed-off-the-arm machine is used where a lapped seam has to be closed in such a way that the garment part becomes a tube. They are common in jeans production where the outside leg seam is normally the type known as lap-felled and it is joined after the inside leg seam in the sequence of construction. The operator wraps the part to be sewn around the machine bed and it is fed away from the operator, off the end of the bed, as the operator sews.

- On the basis of source of power the machinery can be categorised as –
  - Manual (driven by hand or foot with treadle) – Generally used at homes or small scale productions
  - Motorised (Clutch motor or servo motor) – Generally used at industries
- On the basis of level of automation the machinery can be studied as follows:
  - Manual (No automatic functions)
  - Semi-automatic (Handling is carried out by hands but some functions are automatic)
  - Automatic (Sewing as well as handling are automatic)

- On the basis of number of needles the machinery can be categorised as –
  - Single needle machines (e.g. SNLS, SNCS, Bartack, Button sewer, etc)
  - Double needle machines (e.g. DNLS, DNCS, etc)
  - Multi needle machines (e.g. Triple needle chain stitch, Triple needle back rise, 6 needle chain stitch, etc)
- On the basis of programmability the machinery can be as follows –
  - Programmable (e.g. pattern sewer in which the number of steps can be pre-decided to stitch a particular design)
  - Non-programmable (e.g. Clutch motorised SNLS in which the operator controls the steps of machine as it can not be preset)

Basic functions of different components of sewing machine



- **Spool Stand:** This supports the spool rests and provides the space for spool thread guides
- **Spool Rest:** This supports the spool, which supplies the top thread also known as needle thread. The spool rest has a spindle through which the spools of lesser length are inserted. The base of spool rest has a flexible plastic cone. This helps in securing cones of higher capacity.
- **Spool Stand Thread Guide:** These are circular ceramic guides having a circular slot. The top thread is taken from the spool and threaded through these ceramic guides. The position of these guides are kept directly above the spools, so that the thread unwinds under tension.
- **Bobbin Winding Tensioner:** This part is situated in the top right corner near the spool stand base. This tension device consists of steel plates and springs. Tightening the spring creates more tension in the thread, which passes between the two plates.
- **Bobbin Winding Assembly:** This part consists of a metal tongue and a rotating shaft. Empty bobbins are slotted in the rotating shaft. Bobbin thread coming through the bobbin winding tensioner is manually wound for few turns on the empty bobbin. The metal tongue is pushed forward into the empty bobbin. When the sewing machine operates the shaft rotates pulling the thread and winding on the empty bobbin. When the bobbin is fully wound, the thread pushes the metal tongue back, disengaging the drive.

- **Spool or Needle Thread Package:** This contains the thread, which finally goes through the needle.
- **Oil Spray Indicator:** This shows the lubrication oil level.
- **Pre-tensioners:** These contain two small metal discs and a small tension spring, applying little amount of tension on the needle thread.
- **Pressure Foot Pressure Adjustment Screw:** Rotating the screw, manipulates the tension of pressure foot as the screw is connected with the pressure bar spring. Clockwise rotation of the screw contracts the spring and increases the tension, whereas anticlockwise rotation reduces the tension.
- **Takeup Lever:** Thread Take Up is one of the Thread Control Links. After the looper or bobbin hook contacts the needle thread at the scarf point, it pulls a loop of needle thread in order to make the stitch tie. So, it requires the thread to be free and quick. The thread take up executes this function. It provides the thread freely to form the loop of the needle thread during one cycle of its motion, and it also pulls the loop after the hook, or looper releases the needle loop to form the stitch tie.

- **Disk Type Tensioner:** This is the main tension element for needle thread. Tension is imparted by tightening the spring by rotating the screw. The spring compresses the discs between which the needle thread passes.
- **The Needle Bar:** This moves perpendicularly, when the machine operates. At the end of the needle bar is a groove in which the needle butt is housed.
- **The Needle:** is one of the main sewing elements that have an eye through which the needle thread is passed. The function of the needle is to penetrate the fabric and take the needle thread below for stitch formation.
- **Sliding Plate:** This is given so that the operator can slide it and visually inspect the bobbin case position.
- **Presser Foot:** This keeps the fabric pressed while stitch formation takes place and allows the fabric to pass under after stitching.
- **Needle Plate:** This has slots for needle hole and feed dog.
- **The Stitch Length Regulator:** It allows us to control the stitches per inch, by either increasing or decreasing the stitch length.

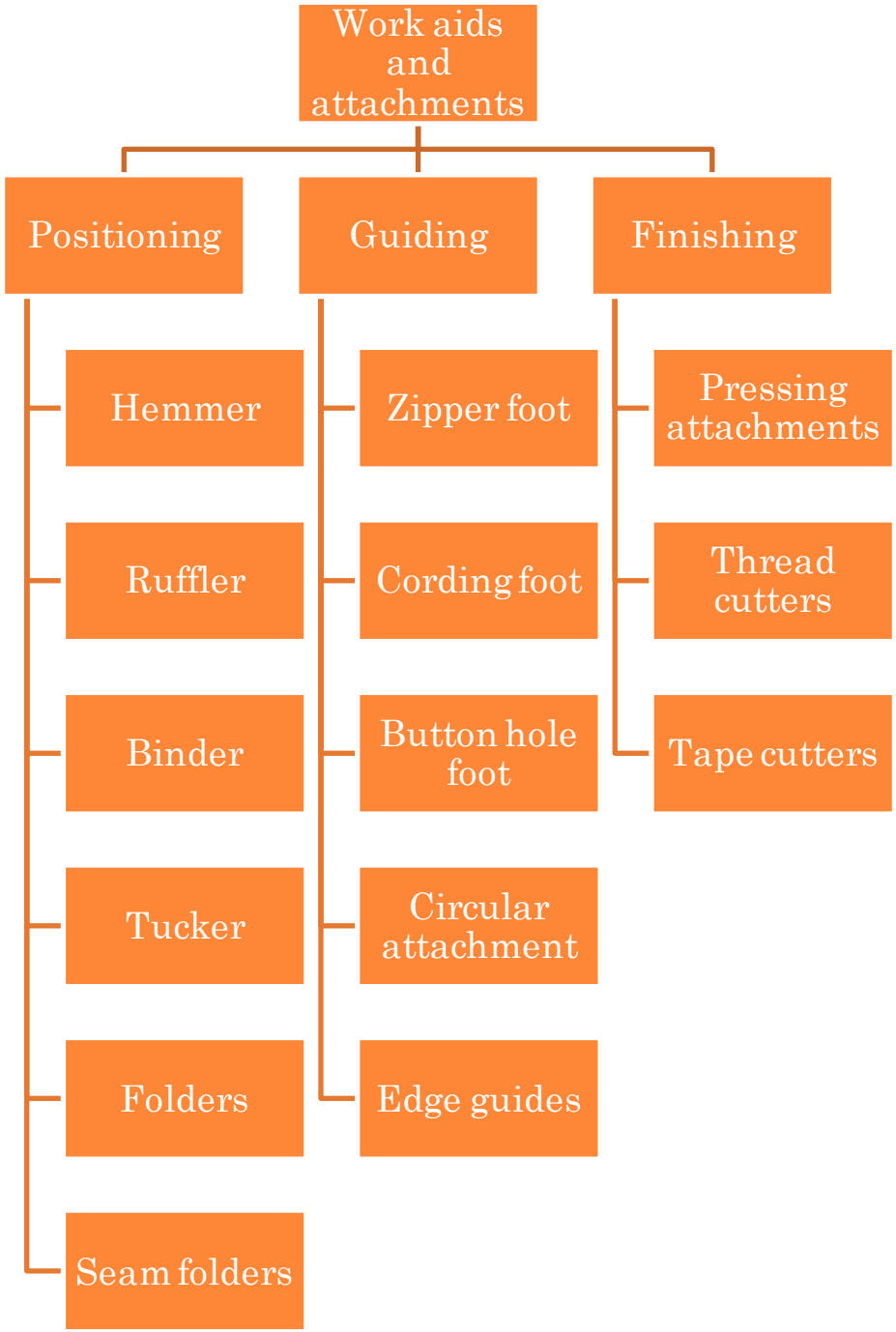
- **Back Tack Lever:** It is used at the start and end of a sewing operation, where we need the reverse motion so that stitches will fall on the same portion again to reinforce the stitching.
- **Clutch Motor:** It provides the power for the sewing machine.
- **Knee Lifter:** It allows us to temporarily lift the pressure foot so that the material can be manipulated. The operator has to keep pushing the lifter with his knee till the time it is required.
- **The V Belt:** It connects the driving pulley of the clutch motor to the driven pulley connected to the main shaft that is housed in the sewing machine arm.
- **Motor Pulley:** It is the driving pulley attached with the clutch motor shaft
- **Pedal or Accelerator:** It controls the speed at which the clutch motor operates. This in turn affects the sewing speed.

- **The Table:** It is where the entire machine head is housed. The table is given with a handy inbuilt scale for measuring purposes.
- **Motor on / off Switch:** It is beneath the table as a console.
- **Hand Lifter:** It is generally located behind the vertical arm of sewing machine. By lifting this, the pressure foot can be lifted for the amount of time. This differs from the knee lifter, as once the lifter is lifted, the pressure bar and pressure foot will not comedown till the lifter is manually pressed down.
- **Thread Take Up Spring:** This is also known as check spring which acts in conjecture with the thread take up lever to maintain correct tension during looping.

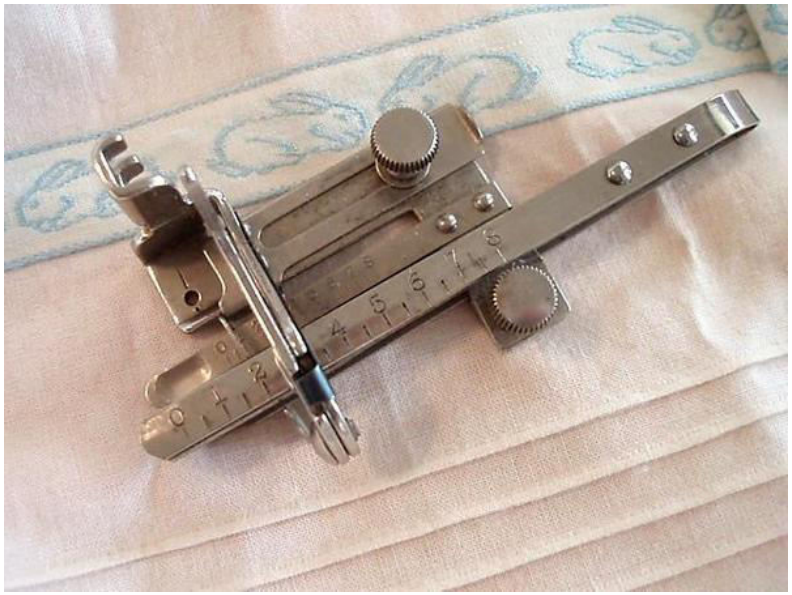
Work-aid and Attachments: Tuckers, hemmer, seam, guide, binders, button hole, folders and trimmers

Work aids are devices which are built into machines, added to them afterwards, attached alongside or made use of in whatever ways a resourceful engineer can devise to improve productivity, improve or maintain quality standards, reduce training time and minimize fatigue for the operator. Sewing machine attachments make sewing machines easier and provide a variety of decorative sewing possibilities. These sewing machine attachments are mechanisms that are attached to sewing machines without cutting through or changing the original frame of the machine. The removal of such an attachment leaves the machine in its original condition.

These attachments are fastened to the machines by screws or nuts and bolts. These are static, dynamic or synchronised.


Work aids and attachments
Positioning
Guiding
Finishing
Hemmer
Ruffler
Binder
Tucker
Folders
Seam folders
Zipper foot
Cording foot
Button hole foot
Circular attachment
Edge guides
Pressing attachments
Thread cutters
Tape cutters

- Tucker
  - This attachment is used for creating uniform tucks from 1/8″ to 1″ width. Finest pin tucks having 3/4″ width could be created easily without any basting. Delicate twin-needle pin tucks are a breeze with the grooves on the base of the presser foot as shown in Figure.



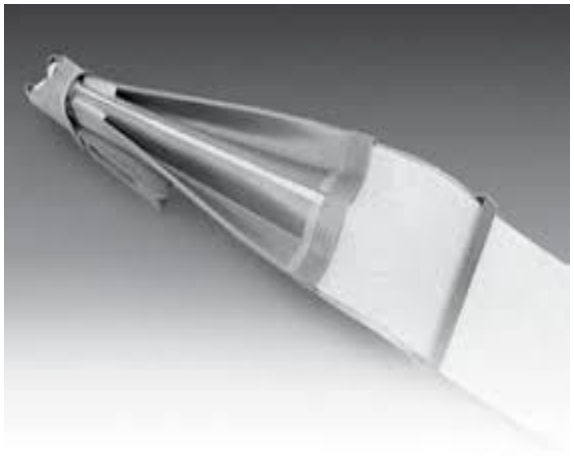
- Hemmer
  - Folders which operate on a garment part without any additional material are knows as Hemmer.
  - Hemmers construct hems from 3/16″ to 7/8″ wide, right on the sewing machine. Machine hemming with the hemmer attachments could save plenty of time compared to hand turning and basting. The hemming portion is automatically turned by the hemmer, and simultaneously the line of stitching is guided close to the edge of the hem. Hems are normally done at various widths, which can be made with the hemmers, suitable for the common requirements.

- Seam Guides
  - Guides are used where sewing must take place in a certain position on a garment.In their simplest form they are edge guides, forming some kind of physical barrier to the edges of the fabric being joined together

- Binders
  - Many folders are available which add further items of self-fabric or other material to a garment and of these, many come into the category are known as Binder. Fabric Edges are frequently bound, either as a means of edge neatening or to create a decorative effect or both.
  - It is commonly utilised for applying readymade bias binding to a straight or curved edge and is a useful attachment for trimming dresses, etc. The binder attachment has a small funnel-like portion for folding and guiding the binding over the edge of the fabric before it reaches the **sewing needle**. This attachment could be used for sewing straight, zigzag as well as decorative stitches.

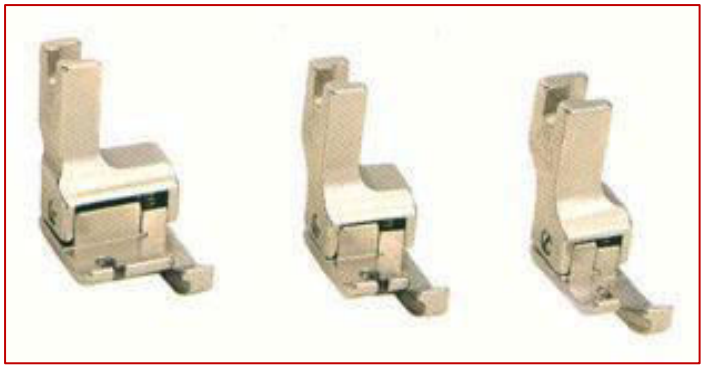
- Buttonhole
  - The two bars in the button sewing foot are fixed to the shank of the presser foot to give additional firmness and it has a rubber sleeve for better gripping of the button during sewing.

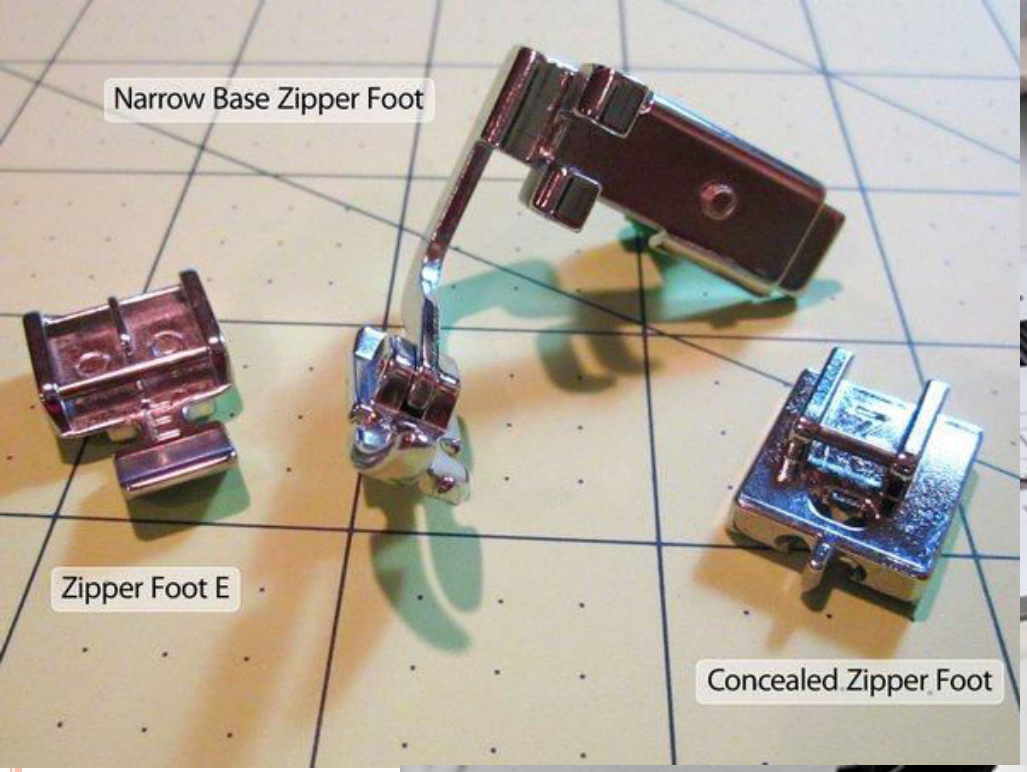
- Folders
  - Folders are used, as their name implies, in situations where fabric must be folded prior to sewing .They vary from the simple fold (which could be achieved by an operator alone, though only slowly and perhaps untidily) to extremely complex combinations of folders (which enable some to be achieved in a fraction of the number of stages that it would take without the folders) and indeed enable some to be achieved that would not be otherwise be possible at all.
  - Folders are frequently used on machines having more than one needle

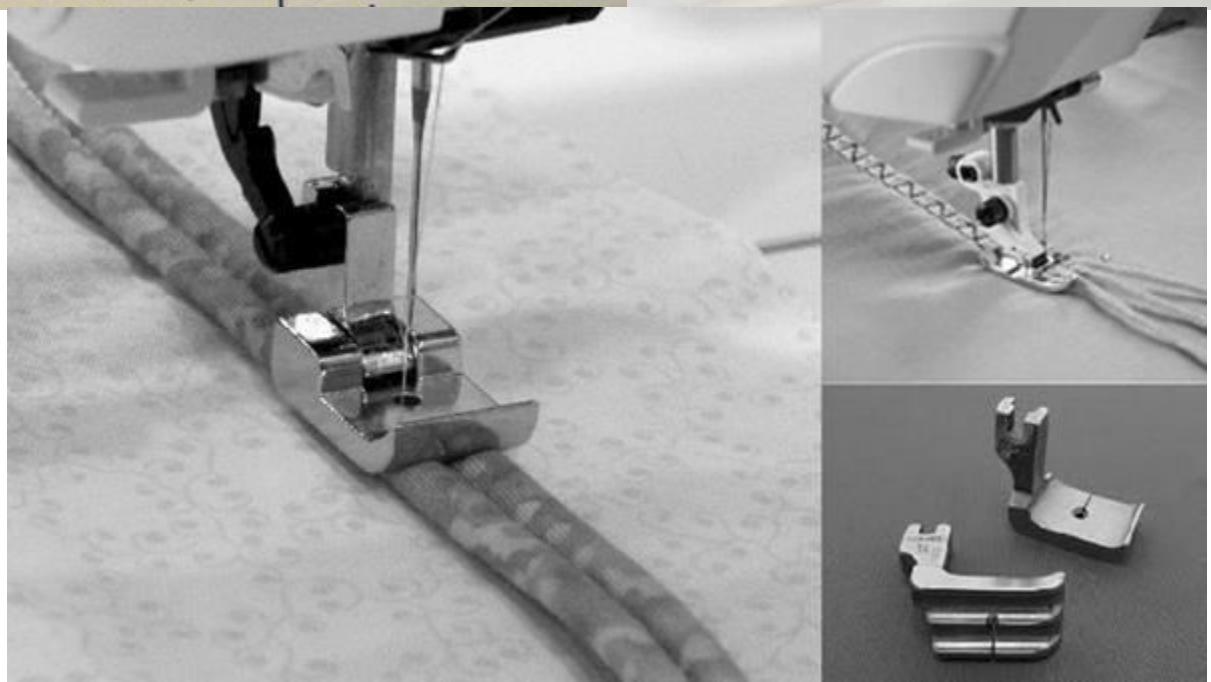


- Trimmers
  - These are extensively required alternatives that minimise production time and get rid of manual thread clipping. On a few machines, sewing threads are cut beneath the throat plate, and a wiper pulls the residue portion of cut thread out of the way in preparation for the next process. Most of the 400, 500 and 600 class stitch machines have chain cutters and latch back devices built-in since the chain stitch formed by these kinds of machines should not be broken by a hand-tearing action.
  - For manual functions hand trimmers are also available.

- Presser feet
  - Presser feet can be used as specialized work aids, in addition to their normal function of holding the materials against the feed dog, when the scale of the situation is within the small size of foot. The function of edge guiding can be performed in some circumstances by a special presser foot called compensating presser foot.




Narrow Base Zipper Foot
Zipper Foot E
Concealed Zipper Foot



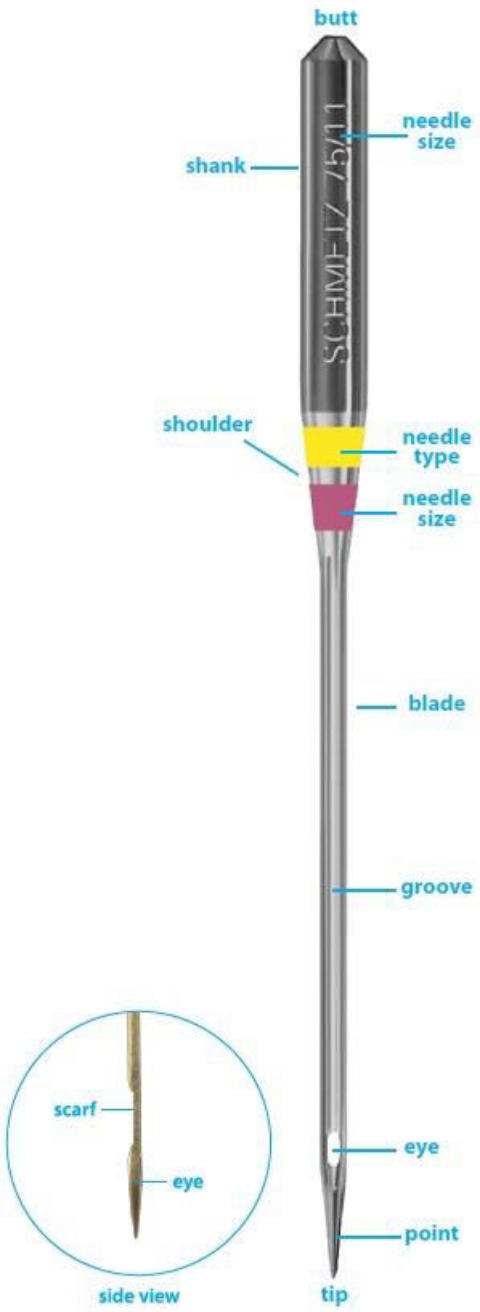
Sewing needles

- Needle is attached to the top of needle bar and is one of the most important parts to sew materials.
- If needle is not good, it will be the cause of various troubles such as thread breakage, material breakage, puckering (wrinkle by sewing), etc. If there is any problem related to the sewing, it is general to check whether threading is proper, then to check whether needle is defective.

Example of blunt needle tip

<Normal>

<Blunt needle tip>



Butt: The beveled end allows easy insertion in the needle bar.

Shank: Household needles have a flat shank, while commercial and industrial needles have round, threaded, notched or other special shanks. Shanks allow perfect positioning of the needle in the sewing machine.

Shoulder: The sloping area transitioning between the shank and blade. SCHMETZ color codes appear on the shoulder.

Blade: Needle size is determined by the blade diameter (i.e., size 75 is .75mm).

Groove: The groove cradles and guides thread to the eye. The length and size of the groove vary according to needle type.

Scarf: The indentation above the eye that allows the bobbin hook to smoothly grab the thread under the throat plate to create a stitch. The shape and size of the scarf vary according to needle type.

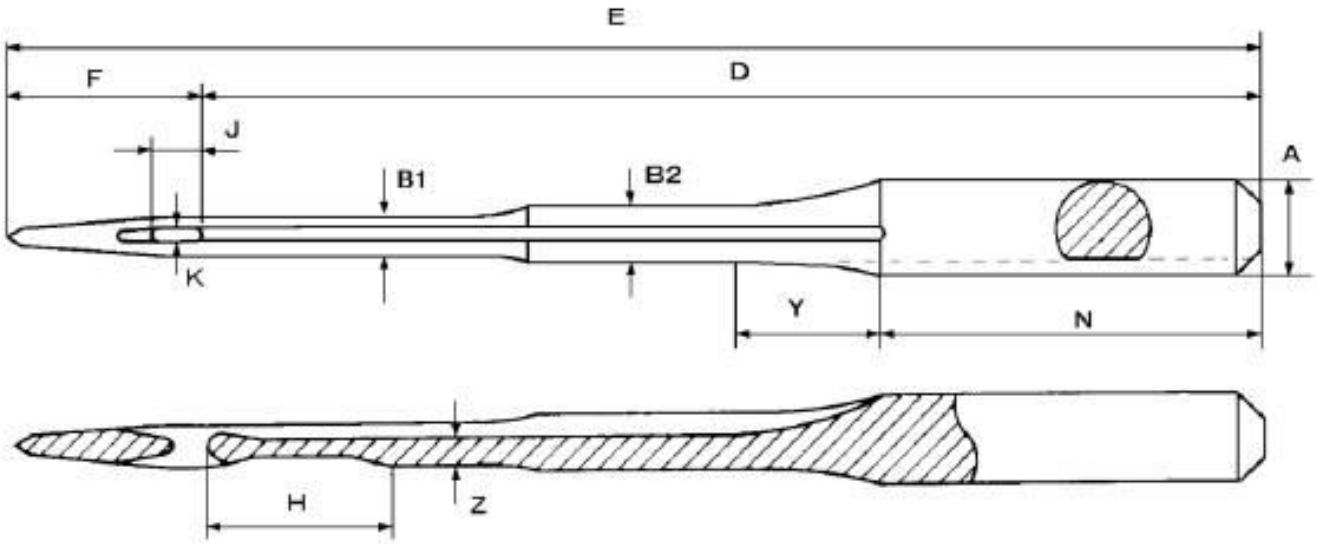
Eye: The hole through which thread passes. The shape and size of the eye vary according to needle type.

Point & Tip: Length, shape and size vary according to needle types.

Needle Type: Upper color band indicates needle type (i.e., Stretch).

Needle Size: Lower color band indicates size (i.e., 75/11).

NEEDLE DIAGRAM

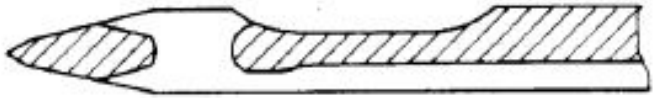


A : Shank diameter
B : Shoulder diameter
E : Length of needle
D : Butt to eyelet
J : Length of eyelet
K : Width of eyelet
N : Length of shank
H : Length of scarf
Z : Depth of groove
F : Length of point

NEEDLE SPECIFICATIONS

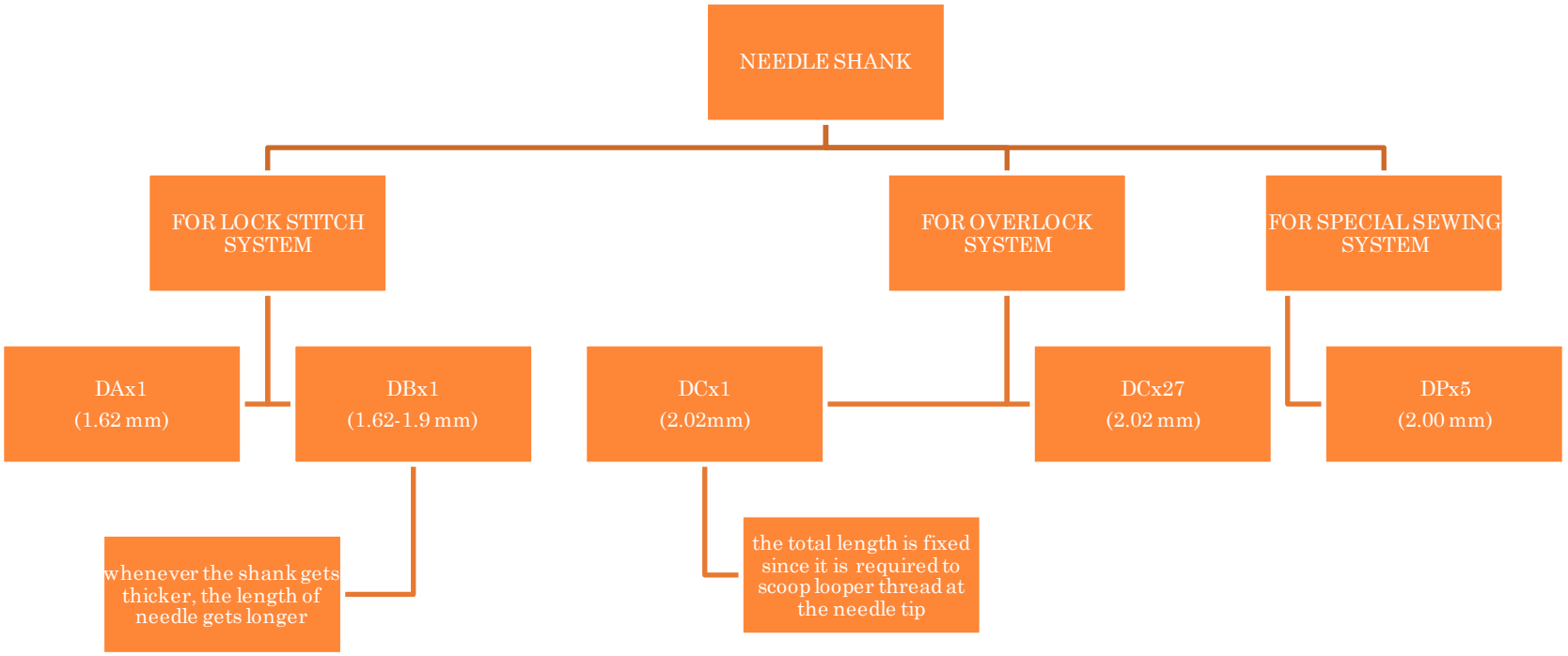
Shape of scarf

Standard type shape



Boat-shaped type

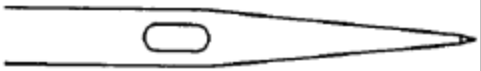
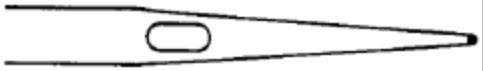
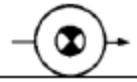
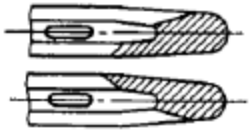
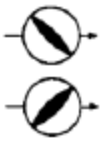
SHANK DIAMETER SYSTEM



Needle Sizes

Sizes			Needle trunk sizes	Sizes			Needle trunk sizes
ORGAN (Japan)	GERMANY	UNION (U.S.A.)	ORGAN (Japan)	ORGAN (Japan)	GERMANY	UNION (U.S.A.)	ORGAN (Japan)
5	45	/	0.47	16	100	040	1.02
6	50	/	0.52	17	105	042	1.07
7	55	022	0.57	18	110	044	1.12
8	60	/	0.62	19	120	048	1.22
9	65	027	0.67	20	125	049	1.27
10	70	029	0.72	21	130	/	1.32
11	75	030	0.77	22	140	054	1.42
12	80	032	0.82	23	160	/	1.62
13	85	034	0.87	24	180	078	1.82
14	90	036	0.92	25	200	080	2.02
15	95	038	0.97	26	230	090	2.30

Needle Tip Study

Tip point	Symbol	Shape of needle tip	Shape of point	Application and feature
Sharp and slim type point	SPI			Light-weight fabrics, light-weight leather
Regular type point	R			General fabrics
Butt type point	BUT			Mainly for button sewing
Slim point	S			Slim shape and J point at needle tip, for high-gauge knit
J ball point	J			For general knit, suitable for standard material as well
B ball point	B			For relatively coarse knit, Ball is φ1/5 of trunk
U ball point	U			For knit and power-net, Ball is φ1/3 of trunk
Y ball point	Y			For elastic materials, Ball is φ1/2 of trunk
Flat tip shape	LL LR			45˚ twisted type knife needle Mainly for leather goods 45˚ reversely twisted knife needle

Needle Selection

Needle size	Spun thread	Filament thread	Main application
#5 to #6	#120	#100	Extra light-weight nylon material and blouses
#7 to #8	#100	#80 to #100	Shirts, knit wear
#9 to #10	#80	#60 to #80	Ladies' dress, pyjamas
#11 to #12	#60	#50 to #60	Gents' suits, students' uniform
#13 to #14	#40 to #50	#40 to #50	Wool fabrics, gents' suits
#16	#30 to #40	#30 to #40	Working wear, jeans
#18	#20 to #30	#20 to #30	Jeans, coat
#19	#10 to #20	#10 to #20	Heavy-weight materials such as denim, sheet, etc.
#20 to #21	#8 to #10	#5 to #10	Heavy-weight materials such as tent, sheet, etc.
#22 to #26	#8 or less	#5 or less	Extra heavy-weight materials such as canvas or the like

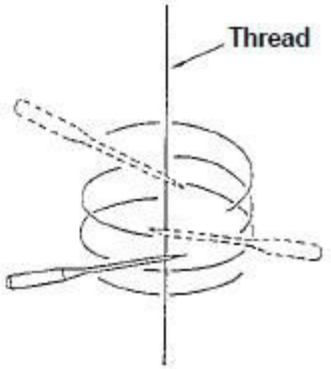
Needle Size Check

【 How to check proper needle size 】

Pass thread used of an appropriate length (approx. 50 cm) through needle, hold both ends of the thread, stretch it vertically as shown in the illustration and slide the needle.

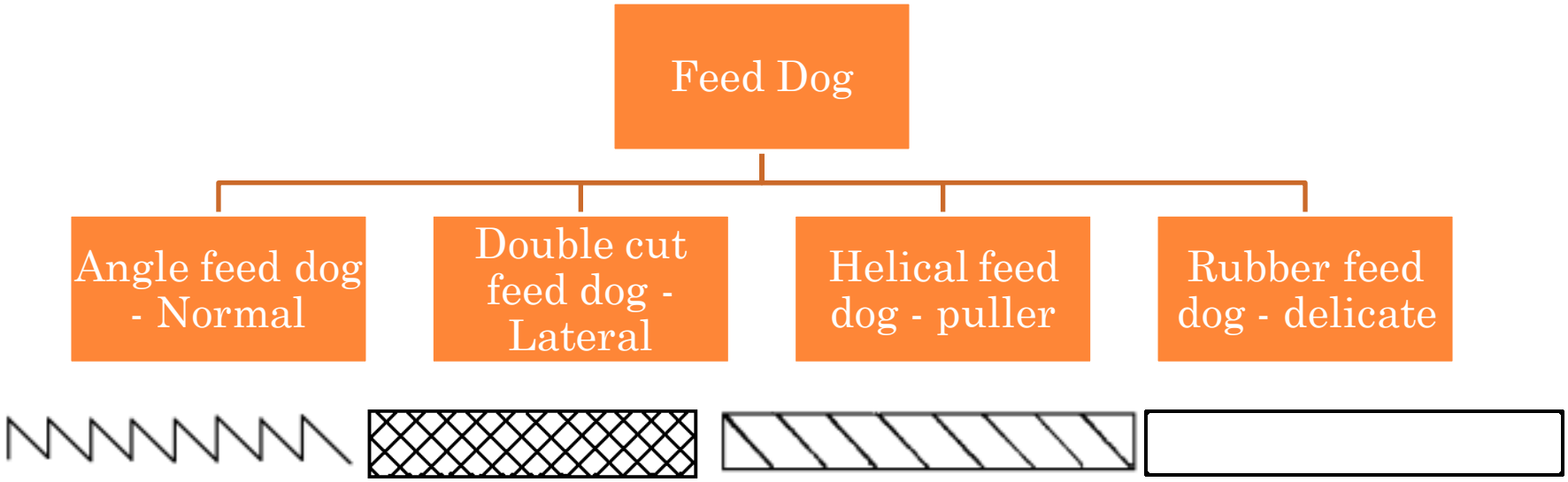
When the needle slides down while slowly turning, it can be said that the size of needle is proper for the thread.

If the needle does not slide down or slides down without any resistance, stitch failure (stitch skipping, thread breakage or stitch looseness) is likely to occur.

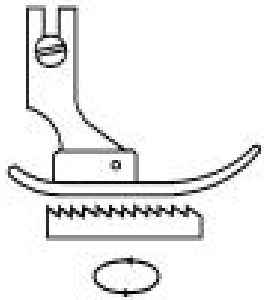


Feed mechanism

- The mechanism consists of synchronous movement of feed dog and presser feet alongwith needle and other participating parts in material feeding. The function of feed mechanism is -
  - Makes the sewing product move per stitch.
  - Can change amount to move and forms stitches suitable for the sewing product.
  - Stretch stitching or gathering stitching can be performed by means of feed mechanism, and prevention of puckering, gathering, etc. can be performed.

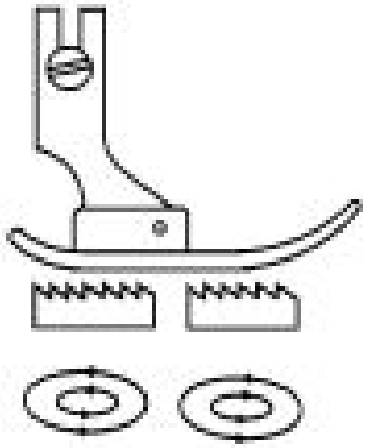

Feed Dog
Angle feed dog - Normal
Double cut feed dog - Lateral
Helical feed dog - puller
Rubber feed dog - delicate

- Bottom Feed
  - This is the most standard feed mechanism, which feeds material with lower feed dog only.
  - Uneven material feeding is likely to occur because of bottom feed only. However, sharp curve stitching can be easily performed and material handling is easy.

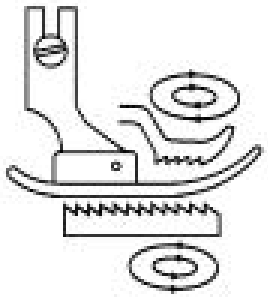


- Needle feed (Bottom feed + needle feed)
  - This is the feed mechanism which needle bar moves in synchronization with bottom feed. Feeding force is strong, and this type can feed material more precisely than the aforementioned bottom feed type sewing machine. Uneven material feeding is reduced, but, stitch shrinking due to thread tightness is likely to occur.

- Differential feed (Front bottom feed + rear bottom feed)
  - This is the bottom feed mechanism, but feed dog is divided into front and rear. This is the feed mechanism which is possible to intentionally stretch material or gather material by changing feed amount of front feed dog and rear feed dog. This is suitable for sewing elastic knit. Differential feed ratio of MO (overlock sewing machine)
    Gathering 1 : 2 (Max. 1 : 4)
    Stretching 1 : 0.7 (Max. 1 : 0.6)



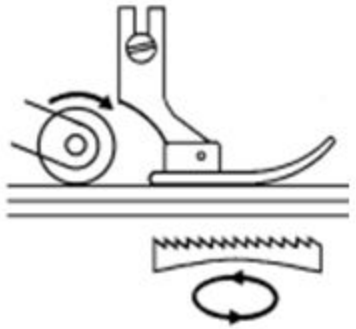
- Bottom and variable top feed (bottom feed + top differential feed)
  - There is a feed dog on the top side in terms of bottom feed, and top feed amount can be adjusted simultaneously together with adjustment of material feed from the bottom side. Accordingly, this is the feed mechanism which is possible to prevent sewing slippage, and to perform edging contracting or gathering.



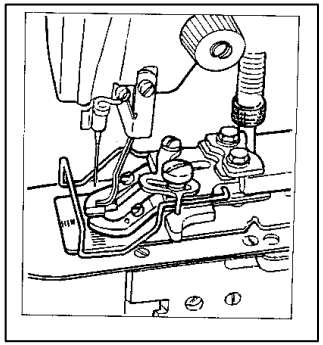
- Differential bottom feed and variable top feed (differential feed + top differential feed)
  - Bottom feed is differential feed, and top feed amount can be adjusted simultaneously together with adjustment (stretching and gathering) of material feed from the bottom side. Accordingly, this is the suitable mechanism which can give most suitable feed amount to the upper and lower materials.

- Unison feed (bottom feed + top feed + needle feed)
  - Feed force of this mechanism is most superior and this feed mechanism is largely used for extra heavy-weight materials or the like.

- Others
  - With cloth pulling roller ... Roller located in the rear of presser foot pulls materials and sewing is performed. Uneven material feeding is reduced and working property is improved.

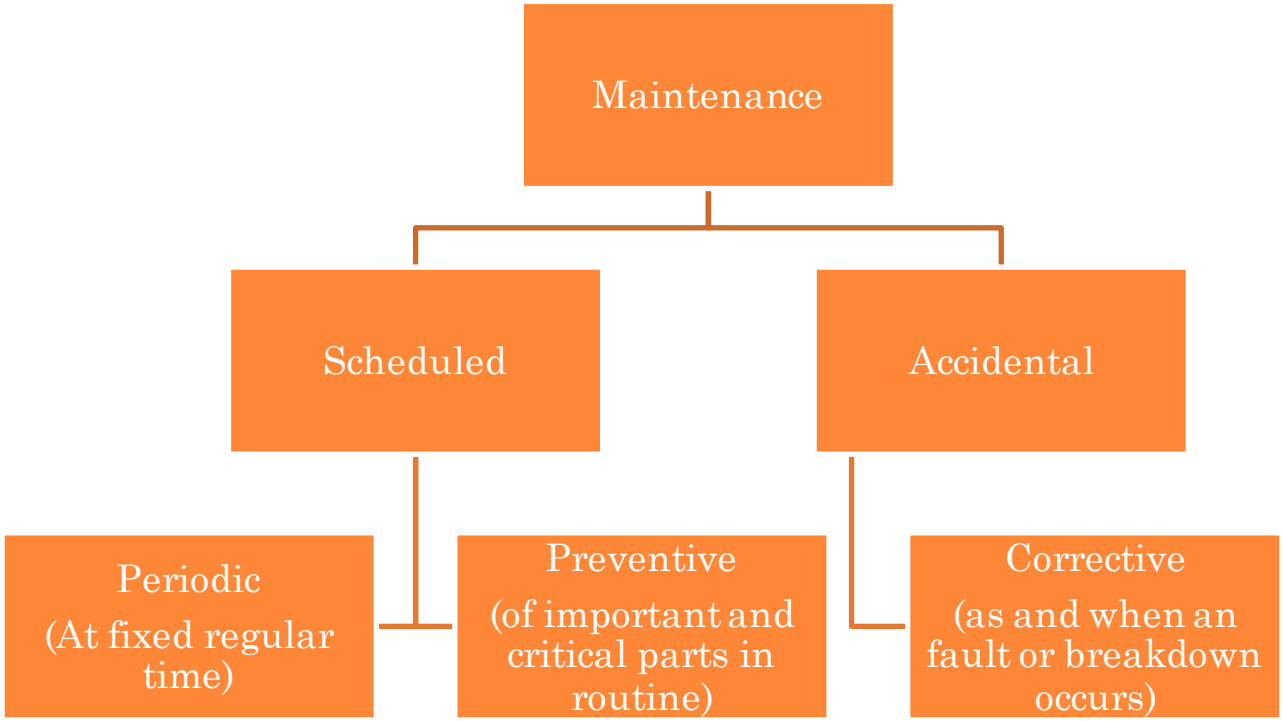


  - Fixed feed ... This is the feed mechanism to feed materials in a fixed state by holding materials between lower plate and upper plate. (Example : cycle machine and automatic machine)



Necessity of preventive, periodic and corrective maintenance

- Maintenance is an Activity involved in maintaining sewing machines in “good working order”. Widely it can be divided into following categories.



- Corrective Maintenance
  - Corrective maintenance can be defined as the maintenance which is required when an item has failed or worn out and to bring it back to working order.
  - Corrective maintenance is the most commonly used maintenance approach, but it has its limitations.
  - When equipment fails, it often leads to downtime in production, and sometimes damages other parts. In most cases, this is expensive also, if the equipment needs to be replaced, the cost of replacing alone can be substantial.
  - Reliability of systems maintained by this type of maintenance is unknown and cannot be measured. Therefore, corrective maintenance is carried out on all items where the consequences of failure or wearing out are not significant (less important items) and the cost of this maintenance is not greater than preventive maintenance.

- Preventive Maintenance
  - Preventive maintenance is conducted to keep equipments working and/or extend the life of the equipments.
  - The primary goal of maintenance is to avoid or mitigate the consequences of failure of equipment.
  - Preventive Based Maintenance help to prevent the failure before it actually occurs. It is designed to preserve and restore equipments reliability by replacing worn components before they actually fail.
  - Preventive maintenance activities include partial or complete overhauls at specified periods, oil changes, lubrication and so on.
  - In addition, workers can record equipment deterioration so they know when to replace or repair critical worn parts before they cause system failure.

  The ideal preventive maintenance program would prevent all equipment failure before it occurs. Following are the two examples of Preventive maintenance

- Periodic Maintenance
  - The periodic maintenance is also a kind of preventive maintenance which focus on all year scheduled maintenance of machines, irrespective of the fact that machine is running or not.
  - The periodic maintenance is done to improve the life of machinery and decreasing the wear and tear. The focus is on each and every part of machine and not only on critical parts like it is done in preventive maintenance.
  - It is more laborious, time consuming and costly but brings overall maintenance of machinery to minimum level.