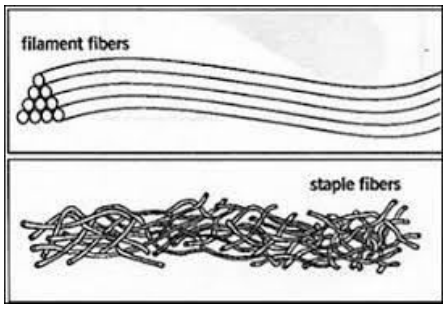
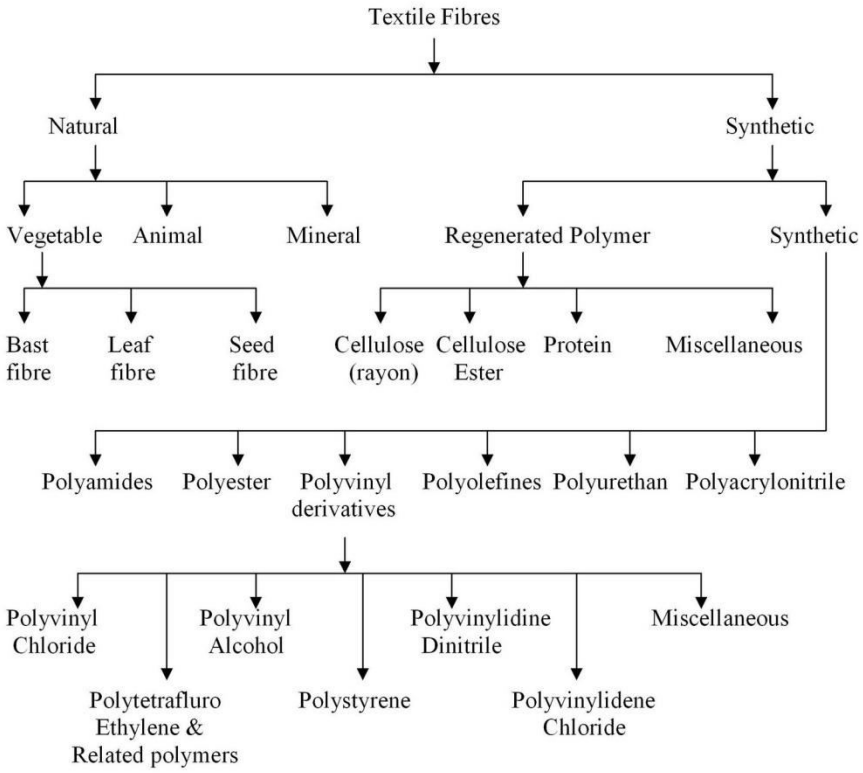
BASIC OF KNITTING TECHNOLOGY

SOME BASIC DEFINITATION OF KNITTING:

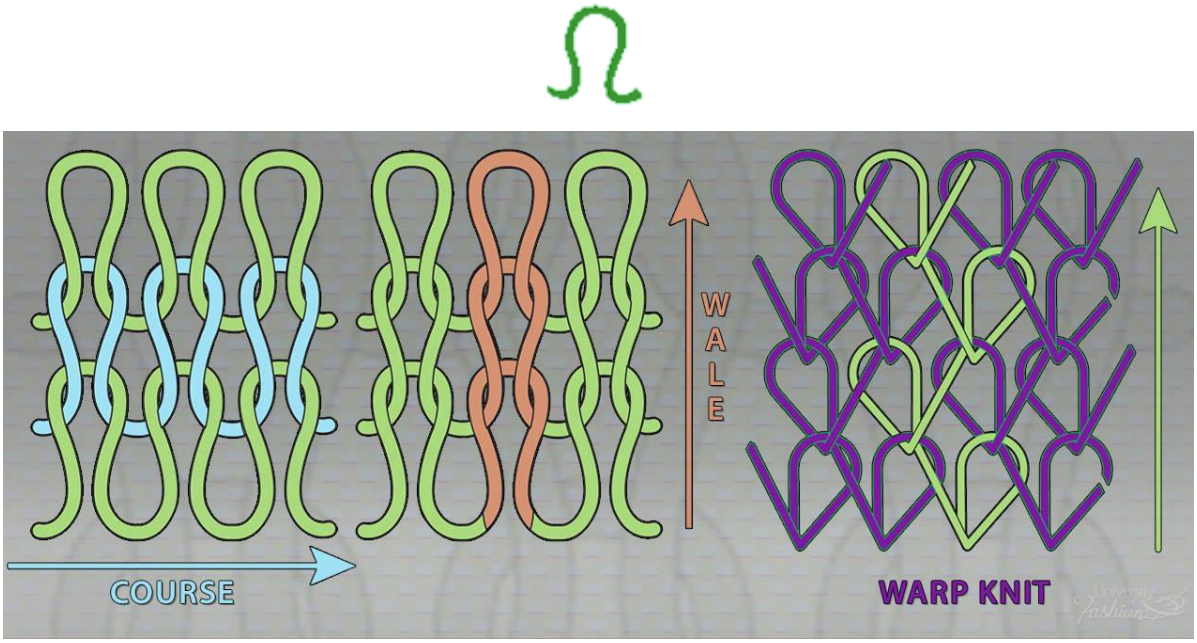
In case of weaving we have warp and weft thread. But in case knitting we call them course or wale. Knitting is done by formation of loop or stitch. Loop or stitch is the basic or fundamental unit of a knitted fabric. It is formed by bending of yarn. Knitting is defined as intermeshing of loops. A row of loops intermeshed along the fabric width or in horizontal direction is called as a Course (not weft). A row of loop along the fabric length or in vertical direction is called as a Wale (not warp). Knitting is done by two ways, course wise as well as wale wise. If knitting is done along the width or the fabric, or course wise then it is Weft knitting. If knitting is done along length of the fabric, or wale wise then it is called as Warp knitting. Now a day weft knitted was done till last few years. Now warp knitting has also taken up. The properties of warp knitted fabric lies between a weft knitted and a woven fabric structure.

FIBER: It is a basic unit of textile. Its length is 100 times to its diameter.

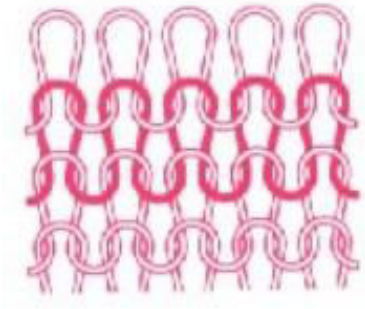




LOOP: The fundamental unit of knitted structure formed by bending the yarn.



COURSE: A row of loops intermeshed in horizontal direction.



WALE: A row of loops intermeshed in vertical direction.

NEEDLE LOOP: This is the part of the stitch drawn through the head of the preceding stitch. It consists of the head and the two legs of the stitch.

SINKER LOOP: This is the connection at two feet belonging to the neighboring stitches lying laterally.

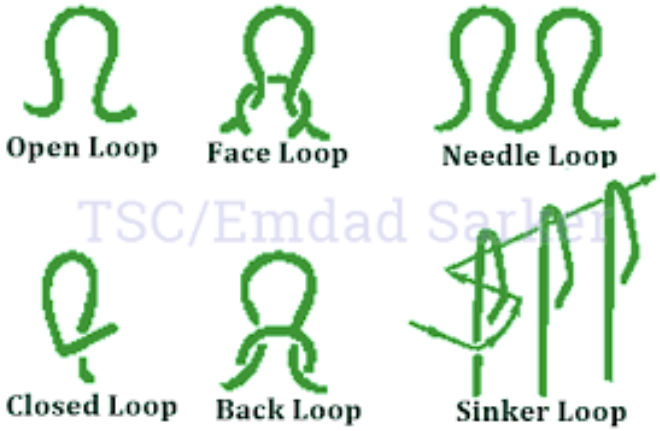
OPEN LOOP:A loop in which the same turned enters and leaves the loop at opposite side without crossing over itself.

CLOSED LOOP: A loop in which the same thread crosses over itself at the base.

STITCH: The smallest dimensionally stable unit of all knitted fabrics is the stitch. A stitch is composed at a head, two side legs and two feet.

FACE STITCH: A loop formed in the earlier loop such that it two legs comes from back to the front on the face of the fabrics.

BACK/REVERSE STITCH: The fabric is stitched in such a fashion that the legs of the stitch enters from front of the fabric towards back in the top arc of the previous course.



FLOAT: It is the length of the yarn that is not received by the needle. The yarn however connects the two loops at the same course with at least one skip.

STITCH DENSITY: It is total number of needle loops in a square arc measurement.

GAUGE: It is the number of needles per inch.

STITCH LENGTH: The length of yarn knitted into one stitch is known as stitch length.

Normally stitch length = 166.66d

d= diameter of yarn

$$d = \frac{1}{24\sqrt{ne}}$$

SINGLE JERSEY FABRIC: A weft knitted fabric made on one set of needles.

DOUBLE JERSEY FABRIC: A weft knitted fabric made on two sets of needles, usually based on rib or interlock gaiting, in manner that reduces the natural extensibility of the knitted structure. These fabrics can be non jacquard or jacquard.

COMPARISON OF KNITTED FABRIC WITH WOVEN FABRIC

Differences of Knitted fabric and Woven Fabric

Sr. No.	Knitted fabric	Woven fabric
1	Weft knitted, or knitted fabric can be made from a single yarn.	Woven fabric can be made from two sets of yarn, warp and weft.
2	Knitting is defined as intermeshing of loops.	Weaving is defined as interlacement of warp and weft.
3	A knitted fabric is stretchable. It thus forms shape fitting property. Hence it can be used for innerwear, sportswear, and ladies garments.	Woven fabrics are rigid, and cannot be stretched.
4	Knitted fabrics are less elastic. They recover little less to their original position after they are stretched.	Woven fabrics have higher elasticity. It means when stretched they recover to almost the original position.
5	The structure due to loop formation is such that there are no wrinkle formations in a knitted fabric. It does not require ironing, and is ready to wear after washing only.	Woven fabric, especially the warp is highly twisted, and is harsh in feel. Woven fabrics need to ironed after washing.
6	A knitted fabric has disadvantage. If a single loop or yarn is broken then the whole fabric starts to open, developing a hole in fabric.	Any breakage in woven fabric can be mended, and it does not spread very easily to whole fabric.

7	Knitted fabrics are difficult to tear. The pressure applied is distributed to the whole fabric.	Woven fabrics can be torn easily like a paper, by holding between two fingers.
8	The yarns used for knitting are less twisted, and thus produce a fabric that is soft in feel.	The yarns used for knitting are more twisted, and thus produce a fabric that is soft in feel.
9	A knitted fabric with same wt./yard is more fuller.	A woven fabric with same wt./yard is more intact than a knitted fabric.
10	Knitted fabric has loops. Air can pass very easily through them.	Woven fabrics are less permeable to air. Air cannot pass through the fabric easily.
11	However the structure also helps to make air packets. This helps in retaining warmth of the body. Hence the knitted fabrics are also used for sweater.	No warmth retaining quality is there in woven fabric due to its structure.
12	Knitted fabric can be made on simple machines without any preparatory process.	Woven fabric can need preparatory processes like winding, warping, sizing.
13	The loop structure of knitted fabric help in absorbency of water.	Due to more twisted and a tight structure these fabrics are less absorbent.
14	Design on knitting can be changed very easily.	To change design on a weaving machine, or loom, warp beam is to be changed if it is warp wise. If the change is in weft, then design on shedding mechanism (dobby, jacquard) is to be changed. It requires extra effort.
15	Thus this can be started with very less investment and space.	Hence a lot of investment of money and space is required for its set up.

In brief knitted fabric is extensible (shape fitting property), wrinkle free, wash and wear, softer, fuller, thicker, less bending length, casual wear, less elastic. It has disadvantages like laddering, bagging, or deformation, difficult in cutting and tailoring.

COMPARISON OF WARP AND WEFT KNITTING

Differences of Knitted fabric and Woven Fabric:

Sr. No.	Warp Knitting	Weft Knitting
1	Single yarn can make the whole fabric.	The number of yarns required is equal to the number of needles.
2	The fed material is cone or cheese.	The fed material is by beam.
3	The fabric is constructed weft wise, or course wise.	The fabric is constructed warp wise, or wale wise.
4	Needles knit sequentially, that is needles knit one after the other.	Needles knit concurrently, that is all needles knit together.
5	The production is less than warp knit.	The production is very high than weft knitting.
6	The fabric prepared may be low quality than warp knitted.	The fabric prepared of very even quality.
7	Production speed decreases with increase in the design.	Production speed do not decreases much with designing.
8	No preparatory process is required. So the extra investment of machine, space, man power is not there.	Preparatory process is required. So the extra investment of machine, space, man power is not there.
9	Machines are low cost	Machines are high cost.
10	A less skilled labour can operate.	A skilled labour is required to operate.
11	Due to these reasons the fabric produced is less in cost.	Due to these reasons the fabric cost is high.

12	The fabric is more stretchable width wise and length wise than warp knit.	The fabric is less stretchable width wise and length wise than weft knit fabric.
13	Difficulty in cutting and tailoring.	Easy in cutting and tailoring.
14	Loop structure:	Loop structure:

WEFT KNITTING MACHINES

There are two types of knitting, weft and warp knitting. Weft Knitting machines are classified as per the bed shape in which needles are fitted. There are basically two types of knitting machines, flat bed knitting machine and circular bed knitting machine. The numbers of beds are either one or two.

A single bed is required to knit the simple plain knitted structure. Only plain knitted fabric is made on single bed knitting machine, and thus form only one layer of loops. It is thus called as single jersey knitted fabric. The bed is named as single flat bed in flat bed. In circular knitting machine this single bed is named as cylinder. Other knitted structures are in two layers. Thus two beds are required for knitting other knitted fabrics or structures, i.e. rib, purl, or interlock.

In all other fabrics (rib, purl, and interlock), the loops used for fabric formation are constructed on two beds, that is in two layers, and are thus referred as double jersey knitted fabrics. In flat bed knitting machines, these are called as V-shaped flat bed. L-shaped flat bed (for rib and interlock). For making a purl fabric, the two beds in flat bed are at 180º. The two beds in circular knitting machine is named as cylinder and dial. Both beds are at right angle to each other in all type of machines. Warp knitting machines are of two types, tricot and raschel.

Elements or Parts of knitting machines

Knitting elements are the main part of the machine. For the weft knitting machine the knitting elements essentially consists of

i. Needles

ii. Sinkers (for the single jersey machine only)

iii. Cylinder

iv. Dial (for double jersey machine)

v. Cams

vi. Needle Plate

vii. Yarn

A knitted fabric is made by needle movement. The needles move up and down vertically. While going up they clear the old loop to make the fabric, and then while coming back they hold the new yarn from the yarn feeder, to make next loop. The movement of the needles is vertical but this movement is generated by the cam. The cams moves in horizontal direction, and has specific space cut between them.

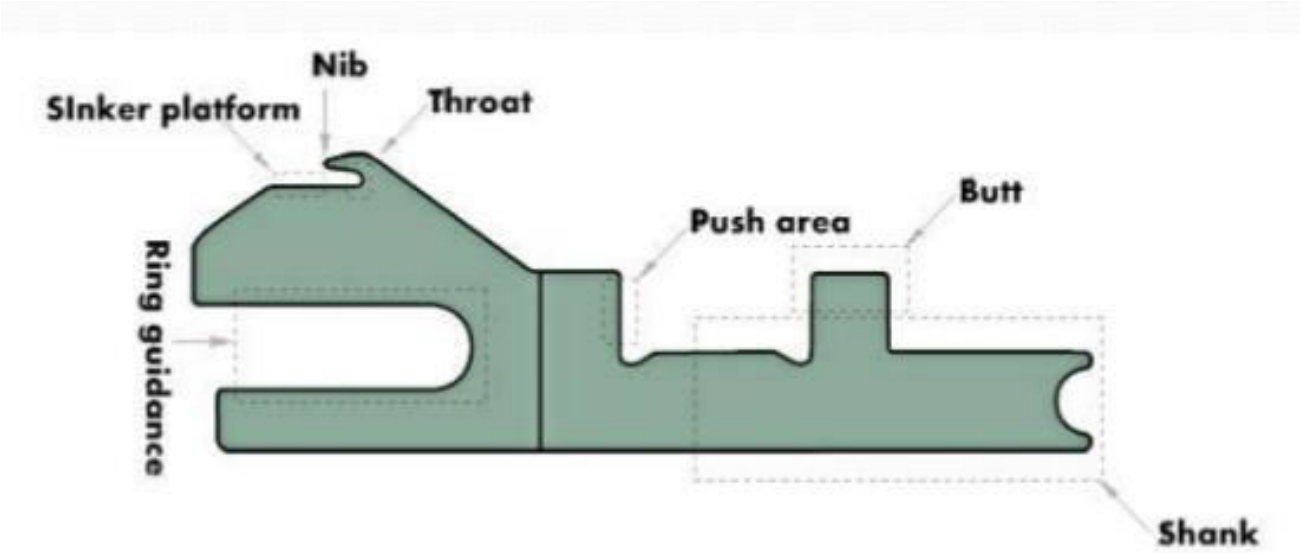
The needles have a hook at the top for formation of loop, and had a protruding surface at the bottom, called as the butt portion. This protruding portion, or the butt passes through the gap of the cam. This cut makes the butt move up and down, and also the needle. The yarn is fed from the creel. In case of weft knitting the feed package is cone or cheese. In warp knitting it is a beam. The yarn is then passed through guide, and then through tensioner. The material or yarn is fed to the needles by yarn feeder. The needles are fitted into the bed of the machine.

Bed may be flat or circular. In case of circular knitting machine if set of needles is single, then the bed is called as cylinder, and the second bed is called as dial. The needles move up and down to form a stitch. This movement to the needles is provided by the cam. The fabric made is then held by weight or take down mechanism.

ii. **SINKER** One of the most important element after needles. It is a thin metal strip adjusted between each needle to hold down the stitch and adjust stitch length also (the web portion). The belly is used to hold the fabric that is knitted. The butt portion provide the to & fro horizontal motion with the help of sinker cam. It performs one or more of the following function: - Loop formation - Holding down the loop - Knock over of loop

The sinker has two main functions and these are: - To hold the fabric loop in a given position whenever the needles rise. - To provide a surface over which the needles draw the loops. Other advantages of using sinkers include: i. The control exerted by the sinker allows minimum tension on the fabric thus

producing a good quality fabric with even loops. ii. Fine adjustments in quality and those required in the knitting of certain difficult tarns and structures are possible. - Facilitates the setting-up of the machine after a partial or full press-off (after the latches have been opened manually).



iii. **CYLINDER** The circular needles bed in which the needles are disposed vertically is called the cylinder. The slots (grooves) cut in the cylinder to receive needles are called "tricks." The cut (gauge) of circular knitting machine is based on the number of "cuts" (or) slots in the space of one circumferential inch on the periphery of cylinder [outer surface of the cylinder]. Machines are built as low as 4 needles per inch to as high as 28 to32 needles per inch. The gauge of the cylinder can be approximately decided of the count and the material of the yarn is known.

Thus for single cotton yarn Count=cut2/6 Cylinder diameters vary according to the type of goods to be manufactured. The diameter varies from about 1cm to about 75 cm. Small diameter machines have less number of feeds than big diameter machines. The speed of the machines is about 20 to 40 rpm for a 60 cm diameter machines.

iv. **DIAL** The dial is another needle bed used only in double jersey knitting machines. The dial is a steel disc in which slots are cut radiating from the centre. Hence it is housing for horizontal needles. The number of slots per unit space conforms to the cylinder gauge in most places.

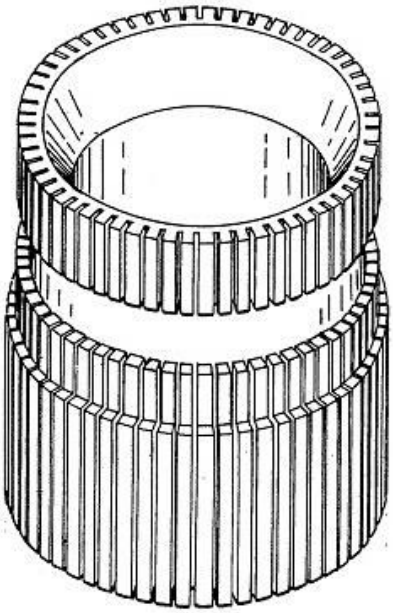


Fig: Cylinder

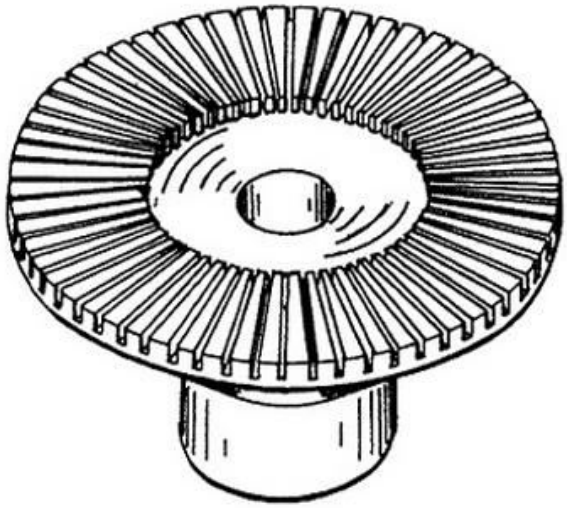
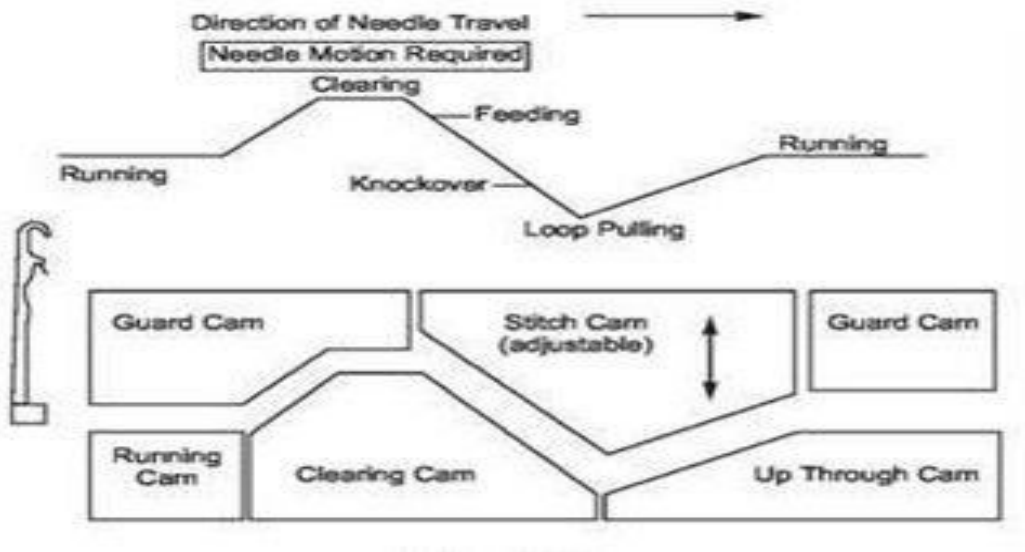


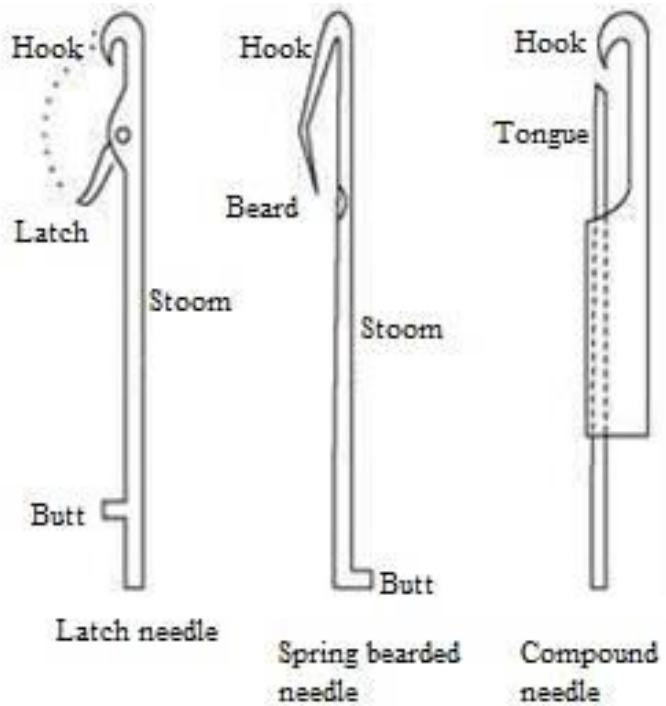
Fig: Dial

v. **NEEDLE CAM** The cams are made of hardened steel and each needle movement is obtained by (needle) means of cams acting on the needle butts. The tracks in the cams are formed by screwing small steel parts with the cam plate in the desired manner. These steel parts are called as cams. Different types of cams are screwed for giving movement to the needle.

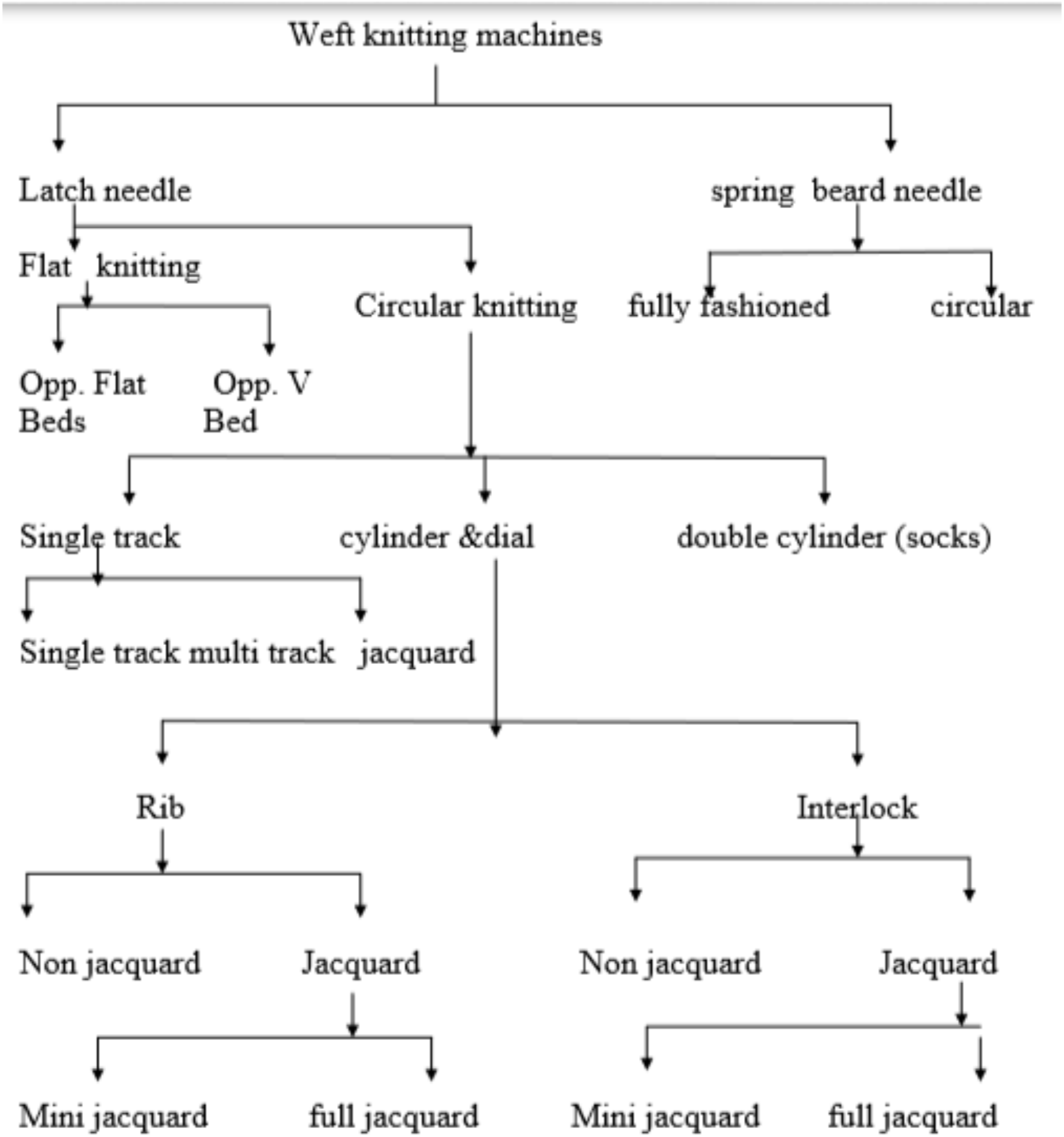
The upward movement of the needle is obtained by the rising cams. Cams controlling the downward movement of the needles are called stitch cams. Stitch cam controls the length of yarn to be drawn or the loop length. Now, the stitch cams are held in a cast iron removable section screwed to the cylinder cam ring and are adjustable in a vertical direction. Guard cams helps to keep the needle butts in their race way (track). Running cam or up throw cam keep the needle butts at a low level until they meet the next rising cam. It helps the needle to return to rest position to relax for new cycle.



i. **NEEDLES** There are three types of needles in common use today in knitting industries. 1. Latch needle 2. Spring bearded needle 3. Compound needle



CLASSIFICATION OF WEFT KNITTING MACHINES AS PER NEEDLES



CIRCULAR WEFT KNITTING MACHINES

They are basically classified into four types according to the type of knitting element used and their arrangement.

1. Plain knitting machines (single jersey) used for producing plain-knit fabrics.

2. Rib knitting machines (double jersey) used for producing rib knit fabrics.

3. Interlock knitting machines (double jersey) used for producing interlock fabrics.

4. Purl knitting machines (double jersey) used for producing purl fabrics.

The continuous rotary motions of circular knitting machine enable two types of machine to be made. They are - Revolving needle bed machines with fixed cam tracks. - Revolving cam box machines with fixed needle beds.

There are two types of machine movements in circular knitting machines Revolving needle or cylinder machines The cams are stationary and the cylinders with trick having needles fitted in it are moving in the grooves (path) of the cams. The butt portion of the needle moves in this trick getting reciprocating motion. Most circular machines are of the revolving needle bed type.

Here the needle bed, fabric and the take up system rotate while the yarn packages, cam box and yarn supply system remain stationary. Reciprocating or rotating cam box machines The bed with the needle is stationary in horizontal movement and the cam revolves. In this case the yarn feeder or creel must move with cam. Mostly used system but not preferred in large diameter and multi creel supply. The raising or running cam helps the needle to either tuck or clear the loop. On Machines of the revolving cam box type fabric and needle beds remain stationary while the bobbin frame rotates with the yarn guides and cam boxes.

Passage of material through a circular knitting machine The given diagram shows the general description and passage of material through a circular knitting machine with revolving needle beds. The machine frame is the body of the machine. The needle beds are supported in the centre of this frame.

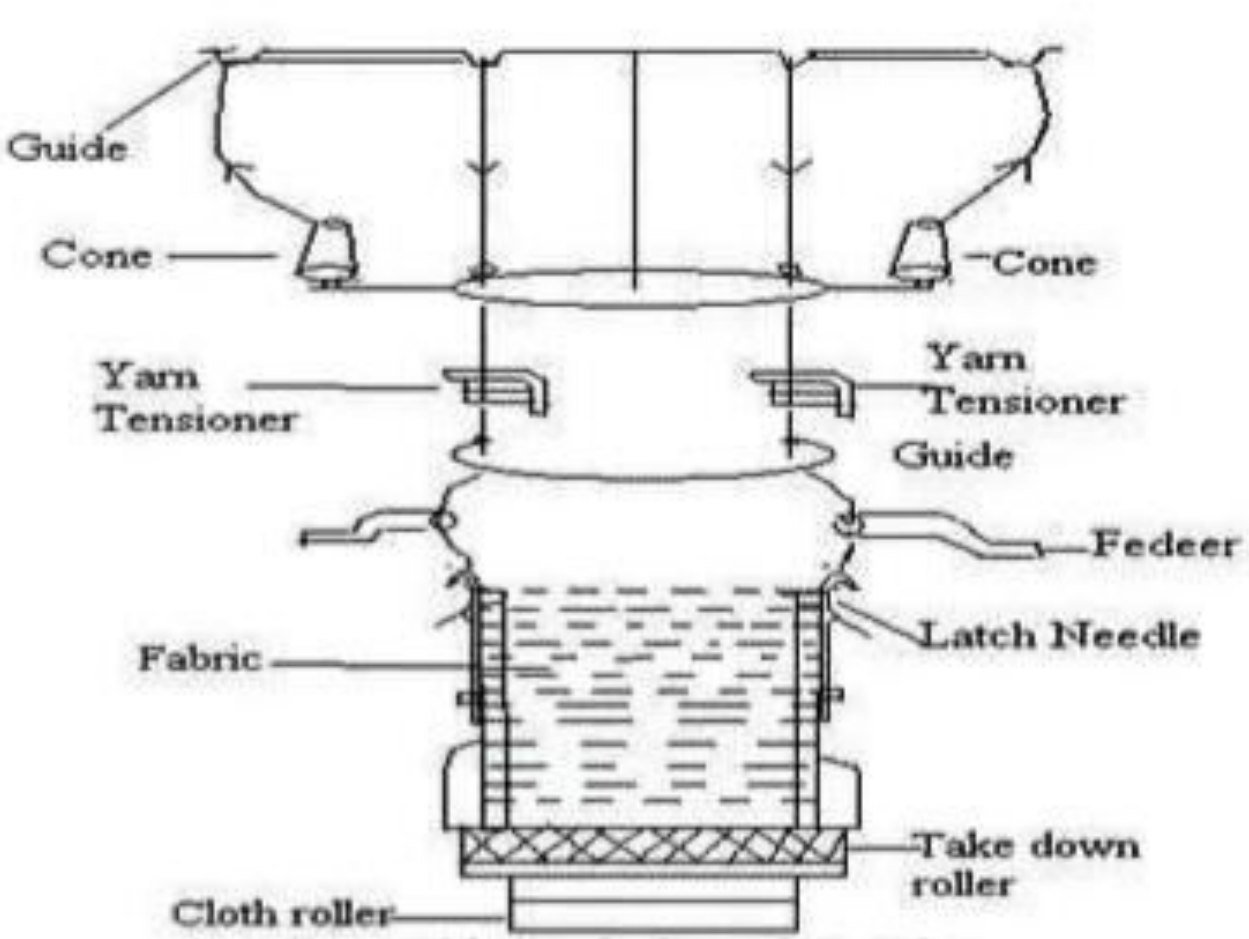


Diagram of Circular knitting machine

Single knitting is fitted with a sinker and cylinder beds whereas rib and interlock machines have both a cylinder and a dial. The needles are inserted into the tricks of the needle beds. The needles are controlled by fixed cams. The yarn packages are set at upper part of the machine on the bobbin stand. The yarn is unwound overhead, following the packages axis to the yarn break stop

motion placed at the top of machine. The yarn then returns down through a guide to the middle stop motion. Then the yarn is delivered to the yarn guides by a yarn feeding system.

Now the yarn guide feeds the yarn to the knitting elements where the fabric is being knitted. Then the knitted fabric goes down inside the cylinder towards the centre of the machine. A spreader fixed inside the fabric tube prevent the formation of creases, as the fabric is drawn into the take down device which provides the tension necessary for stitch formation. The fabric is collected on a roll winding mechanism

FLAT BED KNITTING MACHINE

These machines are commonly used for producing weft knitted fabrics. In the open width form. The basic types of flat knitting machines available are:

1. Rib flat knitting machines ("V" Bed machines)

2. Purl flat knitting machines.

Initially hand operated flat knitting machines were developed and its production were very low hence power driven v-bed flat knitting machines are mostly used in the industries. This machine are used for producing collars, cuffs, sweater, pull, over, mufflers and head caps, from cotton and woolen or acrylic yarns.

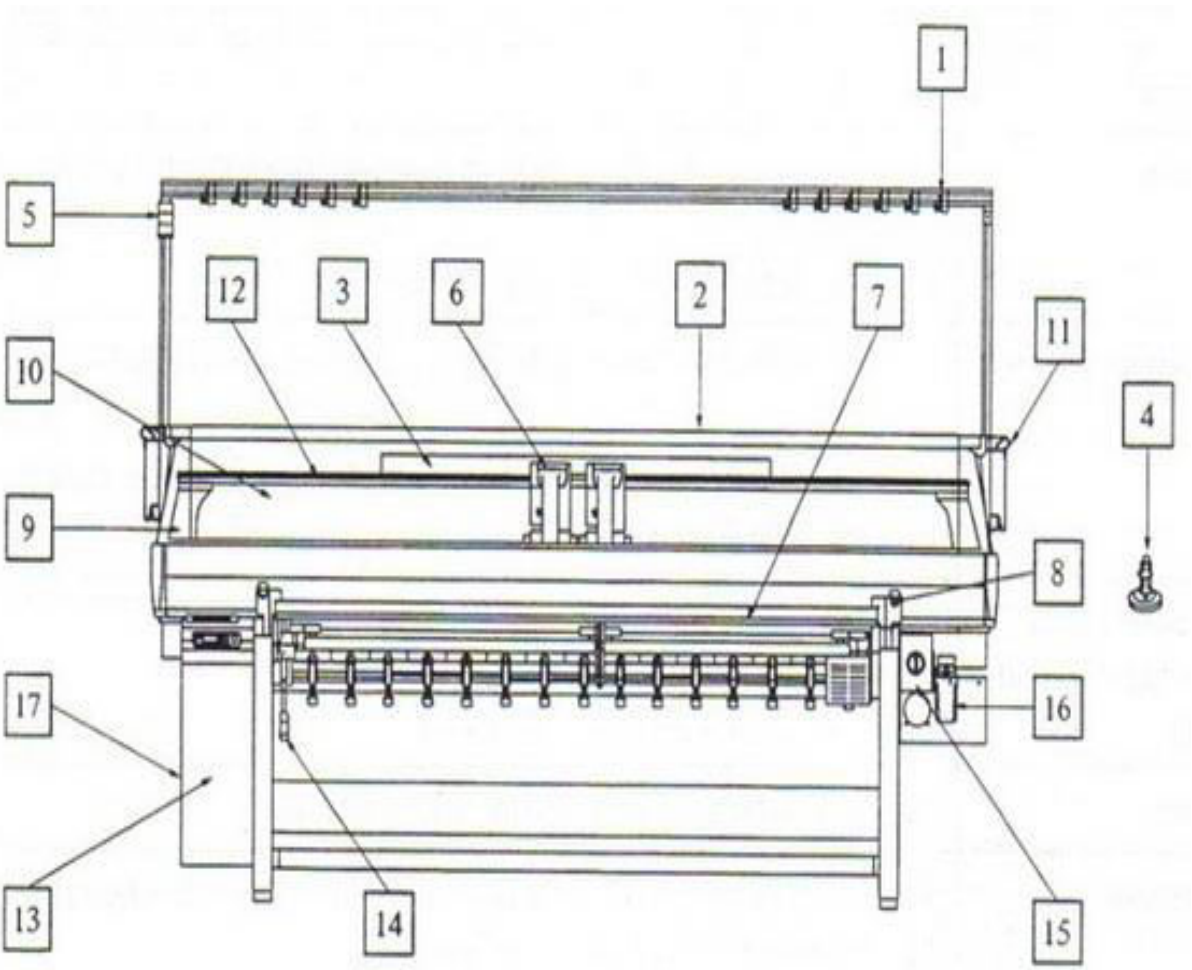
Flat Bed Knitting Machine:

Flat Bed Knitting Machine produces flat pieces. Most common knitting machine for hobbiests and boutique producers. Garments produced from a flat bed knitting machine normally have side seams. ;

It is not possible to knit in the round on a flat bed knitting machine. Flat bed knitting machines cannot work purl stitches or garter stitch automatically. A **flat bed knitting machine** comprising a flat elongate bed on which is retained a plurality of parallel, latchable, needles equally spaced along the length of the bed and each movable relative to the bed in a direction lengthwise of the needles and transverse of the bed length.

Machine Parts of Flat Bed Knitting Machine:

The different parts of flat bed knitting machine are given as below:



Schematic Diagram of Different Parts of Flat Bed Knitting Machine.

1. Tension Equipment: Provides tension force for yarn to be fed to the yarn feeder.

2. Cone Stand Plate: Table on which cone is arranged.

3. Fluorescent Lamp: It is necessary to see the condition of the needle bed gap and so on during knitting. Turn on and off on the controller screen.

4. Cone Stand: Holds the cone.

5. Signal Lamp: There are three indication lamps are as follows:

- Green lamp----------Machine is in operation.
- Blinking Green lamp----------Machine is stopped by operation.

- Blinking yellow lamp----------Machine is stopped because of error, or completion of piece.

6. Carriage: Control the motion of the needle.

7. Operation Bar: Actuates and stops the carriage. Also used for clearing operation errors.

8. Stop Switch: The purpose is to machine in an emergency only.

9. Side Cover: Installed at the both sides of safety cover.

10. Safety Cover: Suppresses the noise and dust.

11. Side Tension Equipment: Pulls the yarn fed to the feeder to create tension as tension equipment does.

12.Carrier Rail: Used for the carrier to move on.

13. Controller: Loads knitting data for floppy disk and command the machine to execute the data. Modifying and inputting data are available in controller.

14. Lock Lever: By execute this lever, the sub roller is pressed and comes into contact with the main roller. Pull the lever toward you to release the sub roller from the main roller. Press the lever downward to engage the sub roller.

15. Main Power Switch: Cuts off power supply. This switch has emergency stop function. In case of an emergency, turn this switch off.

16. Oil Pump: Supplies oil to the brush holder and the racking side plate.

17. Breaker Switch: This protects the machine from odd power source to the turned off automatically. The breaker switch is back side of controller.

KNITTED STITCHES

The stitch or loop is the fundamental unit of knitted fabric.

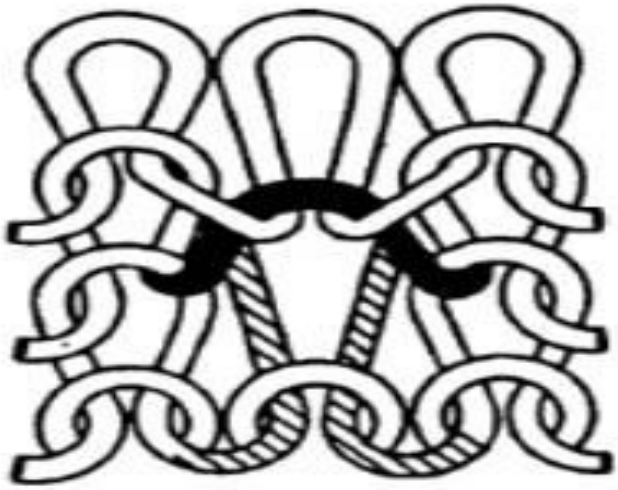
There are 3 types of stitches.

KNIT STITCH

This is the normal stitch that we see in a knitted fabric. It has a face and a back. The side of the fabric that appears to be normal is the face side of the loop, and that appears to be back of the fabric is formed by back loops. The combination of these *face* and *back loops* help in making of different basic knitted fabrics.

TUCK STITCH

This stitch is formed when the last loop is help along with the next loop. It means two loops of different courses are held together. This help in developing derivatives of different of basic knitted fabrics.



Tuck Loop

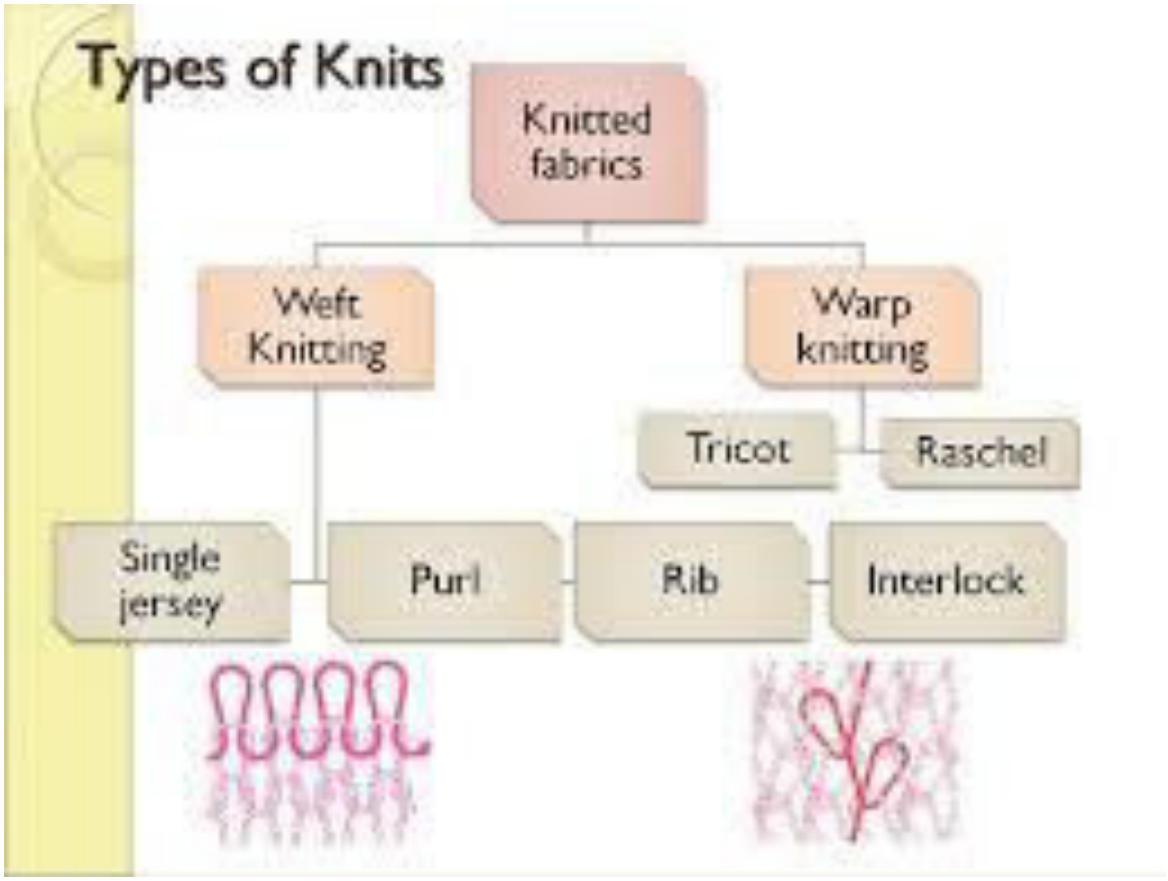
FLOAT OR MISS STITCH

It is formed when a stitch is not formed. In this case wither the new stitch is formed on its place by use of another yarn, or the loop from the last course that is below it takes its place. Like a tuck stitch, it also helps in developing derivatives of different of basic knitted fabrics.

Float Loop

BASIC KNITTED FABRICS

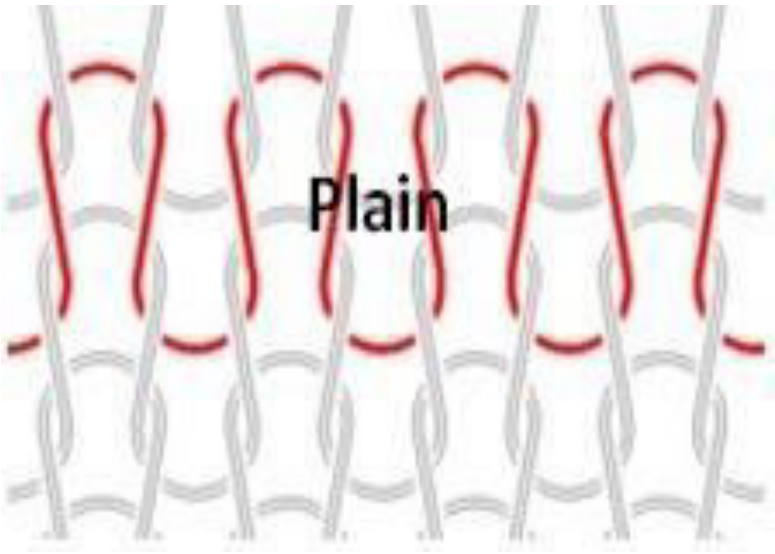
While discussing various stitches, we had discussed that various stitches forms different type of knitted fabrics. Combination of face and back loops of a simple knit stitch form the different type of knitted fabrics, and its combination along with tuck and float stitches form different derivatives of these knitted fabrics.



Normally there are four type of knitted fabrics, plain, rib, purl and interlock. The basic knitted fabrics are:

PLAIN KNITTED FABRIC

It is the simplest and most widely used knitted fabric. It is developed by using knit stitches side by side, horizontally as well as vertically, to form knitted fabric. It is made on single set of needles. The fabric can be made on flat knit or in circular (tubular) form. Since this is the only knitted fabric made in single layer, it is also called as ***single jersey fabric*.**



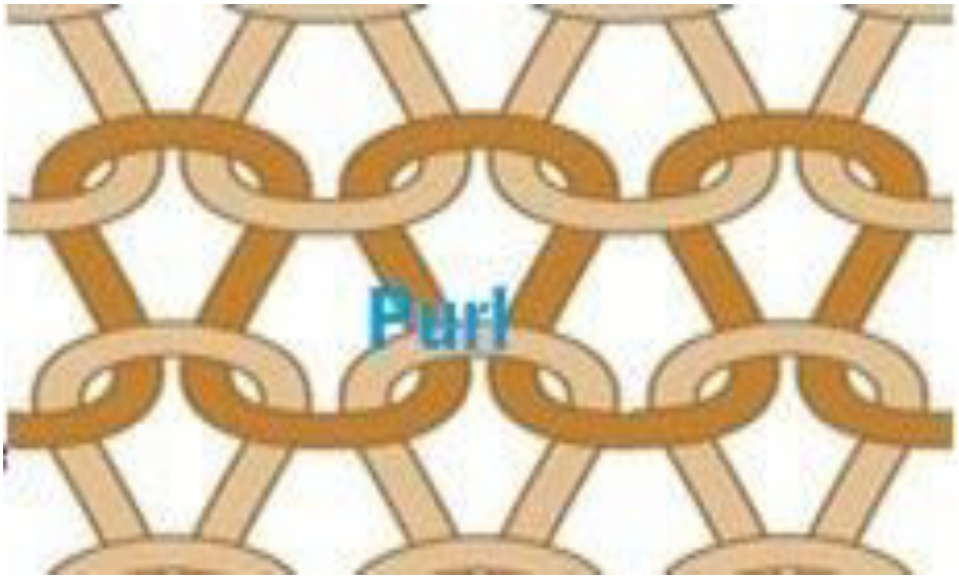
RIB KNITTED FABRIC

This fabric can be developed by knitting face and back loop alternatively. It means that odd number of wales (vertical column of loops) will be made of face loops, and the next or even wales (vertical column of loops) will be of back loops. This will be made on two sets of needles, and is thus in two layers. It is called as *double jersey knitted fabric*. One knitting face, and other knitting back loops in the same row, means face and back loops alternately. This fabric shows horizontal lines (vertical gap type), and is very stretchable widthwise.

All extremities in knitted fabrics like collar, end of the sleeves, and the bottoms of the T-shirts, sweaters are made of rib. It is extremely stretchable widthwise. Due to this, it is also used for ladies wear and shape fitted fabric.

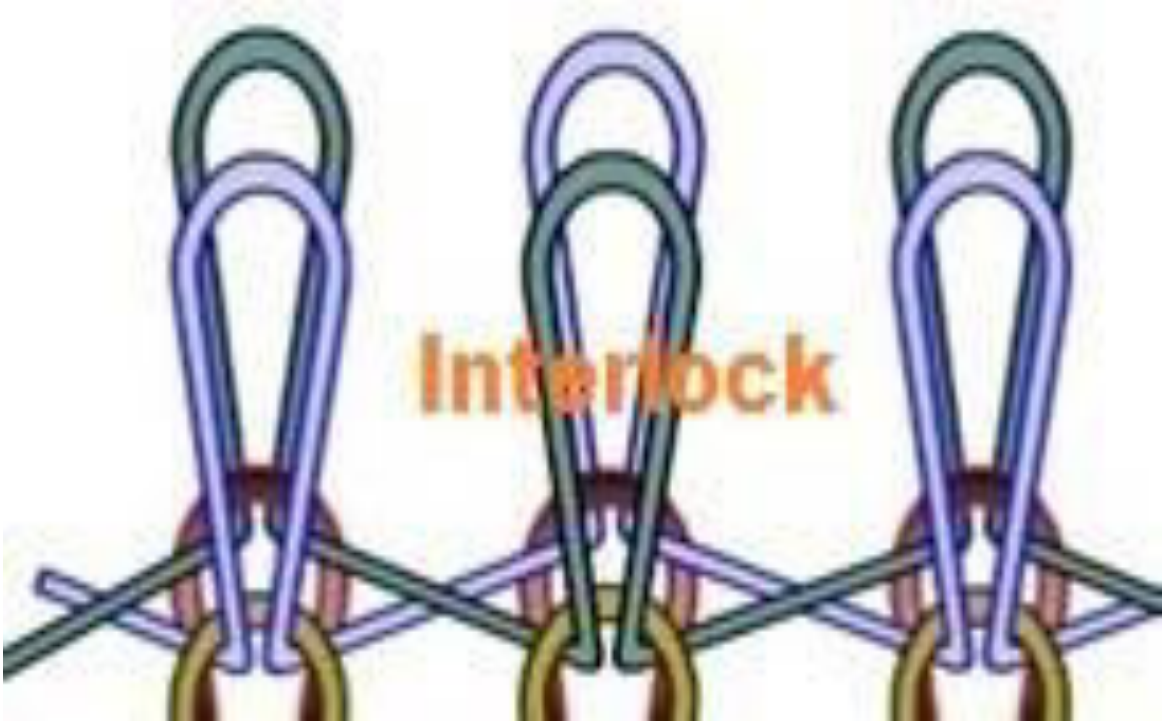
PURL KNITTED FABRIC

This fabric is made by knitting alternate courses (horizontal row of loops) of face and then back loops. It appears like purl or as if the fabric is being worn from reverse. The machine used is has two beds fitted at 180º to each other and forms a double jersey fabric.



INTERLOCK KNITTED FABRIC

This fabric is combination of two ribs fitted or fixed in a single fabric. A rib fabric shows vertical line type gaps. The other rib fabric fits into the first one in this gap, and thus appear as a plain fabric from the front and the back. This fabric is therefore equal to two fabrics in thickness and weight.



LATCH NEEDLE

It is mostly widely used in weft knitting. Also called as “self actuating” needle because they require no external element (sinker) to close the hook. The swing of latch solves the purpose. It consists of a hook at the top of the needle, and the space between the hook and the needle stem can be bridged by a latch which swings freely. Latch needles are given individual movement sliding in grooves, and these grooves are normally called „tricks“. The stem is a straight portion of the needle with a protruding butt, some distance from the end of the needle.

The reciprocating movements to the needles are given through this butt part of the needle.

MAIN PARTS OF LATCH NEEDLE

HOOK: draw and retain new loop.

SLOT: that receives latch blade.

RIVET: used to retain the latch blade.

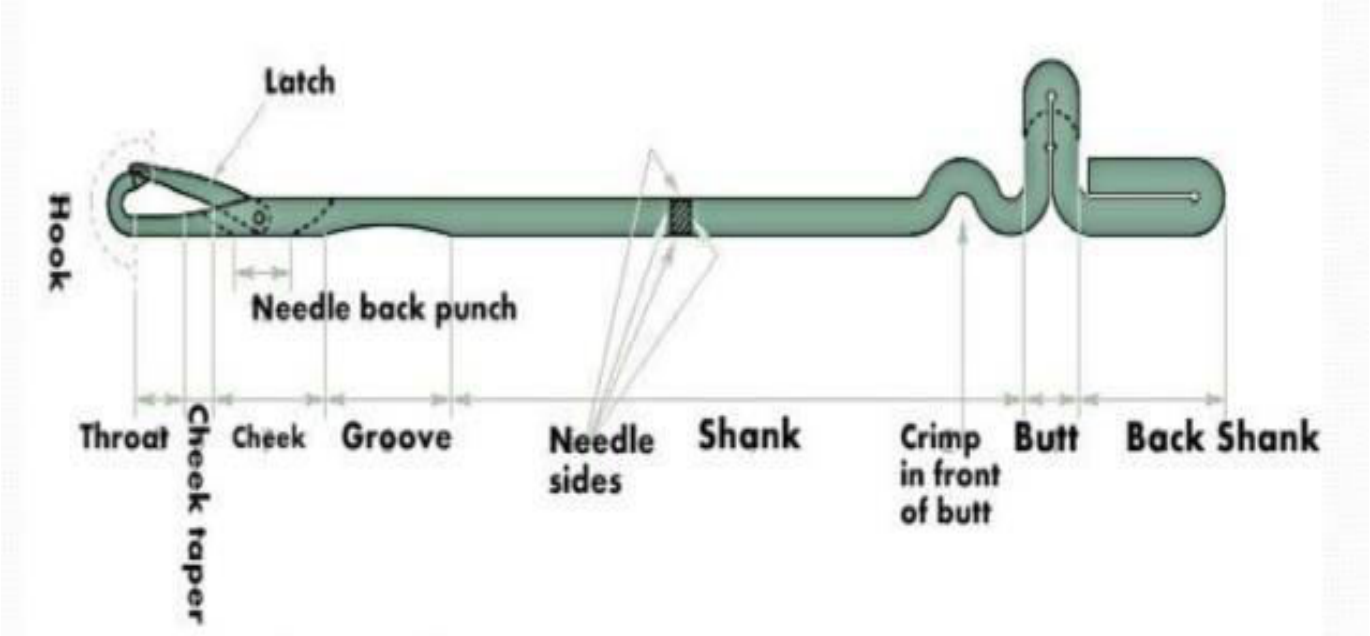
LATCH BLADE: help in knock-over of old loop.

LATCH SPOON OR CUP: helps to cover the gap between the hook tip and stem to knock-over old loop

STEM: holds the last loop of fabric during rest or clearing position.

BUTT: converts rectilinear motion to reciprocation motion from cam to needle

TAIL: extension of the butt



KNITTING CYCLE OF LATCH NEEDLE

A latch needle knitting cycle can be explained by 5 different positions.

***REST POSITION*:** Needle hook is in level of top merge of trick. The loop previously formed is in hook and needle is in position to move up.

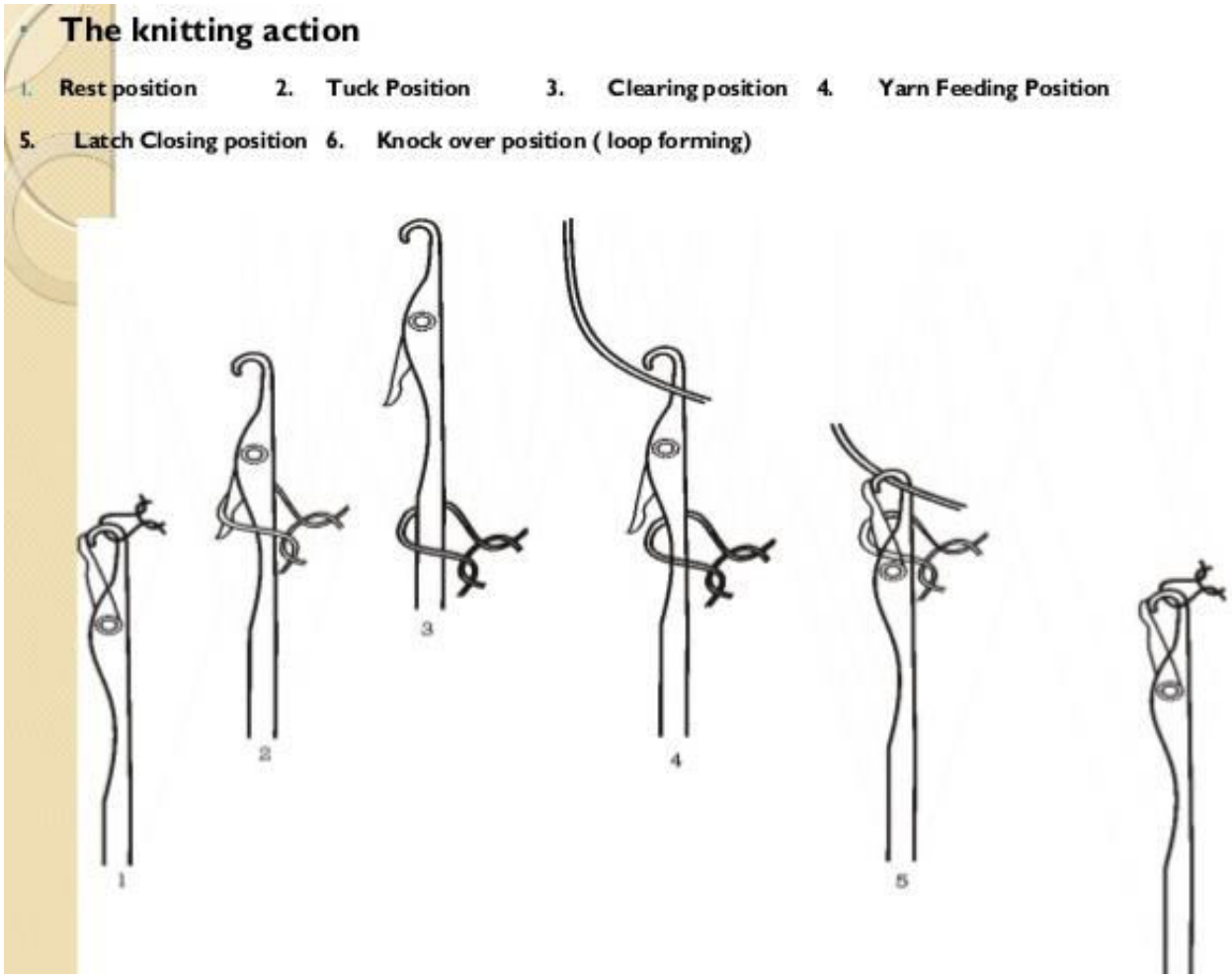
***RUNNING POSITION*:** The needle gets upward movement with the butt by pressing it against clearing cam. The latch opens. The old loop starts descending on to latch.

***CLEARING POSITION*:** The needle is at top most position. The old loop is cleared from latch and is on to stem. The hook is ready to take new yarn.

***YARN FEEDING*:** The needle starts to descend. The hook holds the new yarn got past by the feeder. The old loop starts to slide up closing the latch and new yarn inside the hook.

***KNOCK-OVER POSITION*:** The needle descends to the downward position and draws the loop length. The old loop first closes the latch with new Yarn inside it that is ready to form loop.

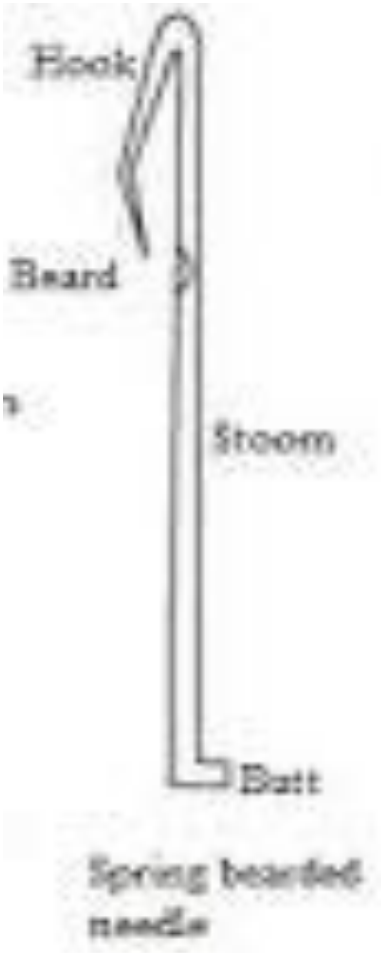
The old loop is knocked over the hook portion of needle, converting the fed yarn into loop.



SPRING BEARDED NEEDLE

Bearded needle was the needle used in first knitting machine known as stocking frame. Needles having a long terminal beard that can be flexed by an action known as pressing. It can be made from single piece of metal in a machine gauge as fine as 60 needles per inch. This is the oldest needle which is simple in construction and cheap in manufacture.

The bearded needle, which was invented by the reverend William lee in 1859, consists of hook with the top curved part continued downwards and finished with a point. It is this downward continuation that is called the beard. Opposite the point of the beard is a groove cut into the needle stem. This is called the eye of the needle.



Main parts of spring bearded needle

Head:

Beard:

Eye or groove:

Stem:

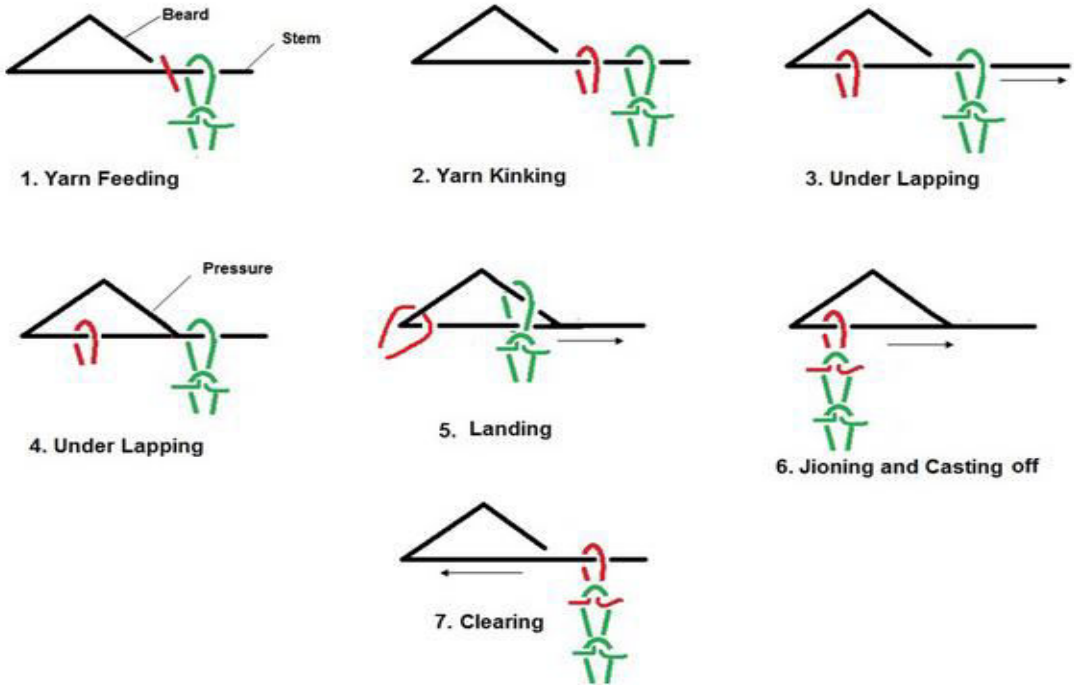
Butt or shank:

KNITTING CYCLE OF SPRING BEARDED NEEDLES

CLEARING POSITION: The old loop is round the stem of the needle and the yarn is fed at a higher point on the needle stem and kinked into a loop. Each wale in the fabric requires a separate needle.

FEEDING POSITION: The needle is now moved down until the newly formed loop is under the beard and this time the beard is pressed. A metal bar is used to exert pressure on the needle beard so that the point is pressed into the eye of the needle. Closed and the old fabric loop moves to the outside of the needle beard. When the fabric loop has been launched in this position the pressure on the beard can be released.

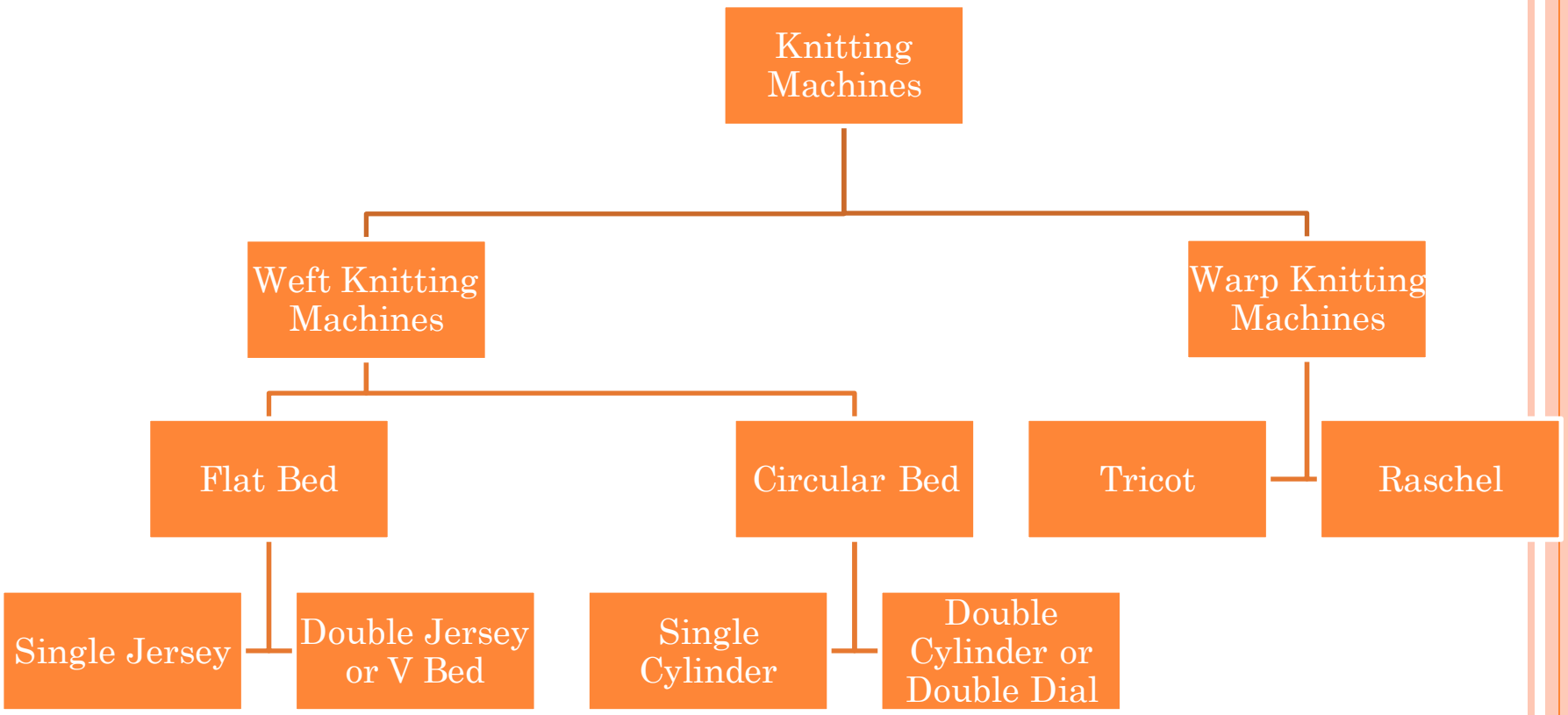
KNOCK OVER POSITION: The needle now moves to its lowest position drawing the new loop through the old fabric loop which is now cast-off. The needle now returns to start another course.



A comparison between flat bed and circular bed knitting machines

Knitted Garment Tech

III Sem, Fashion Tech



Knitting machine types

The flatbed and circular bed knitting machines are used in weft knitting. The two differ mainly on the basis of the shape of frame and the shape of fabric they produce. There comparison is as following:

Differences

1. Flat bed knitting machines have needles arranged on flat needle beds known as frames while circular knitting machines have needles arranged on circular frames known as cylinder or dial.
2. Flat bed machine uses two way directional cam while circular machine has unidirectional cam.

3. Flat bed knitting machine has slow speed than circular bed knitting machine.
4. Flat bed knitting machine provides more options for designing new patterns than circular knitting machine.
5. Flat bed knitting machine is more versatile than circular bed knitting machine.
6. Circular bed knitting machine is more efficient than flat bed knitting machine.
7. Flat bed knitting machine produces flat surface fabric while circular knitting machine produces seamless tubular fabric.

8. Flat bed knitting machine is available in different widths while circular knitting machine is available in different diameters.
9. Flat bed knitting machine need to change yarn director after every course while circular machine uses different director for each yarn.

Similarities

1. Both flat bed knitting machine and circular bed knitting machine produces weft – knits.
2. Both machines use latch needles generally for knitting.

3. Both machines are available in market to knit double jersey as well as single jersey knits.
4. Both machines are available in manual and semi-automatic modes in market.
5. Both machines are used in knitwear industry as per the design need and application.

Knitted Garments – Classification on the basis of production methods

Knitted Garment Tech

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Knitted garments

- The garments that are manufactured by knitting or with knitted fabrics are called as knitted garments.
- The knitted garments can be manufactured by cutting and sewing knitted fabric just like woven fabric. Also, there are different methods available for knitted garments in which no cutting is required.
- On the basis of different techniques available, knitted garments can be produced in different ways.

Knitted garments classification

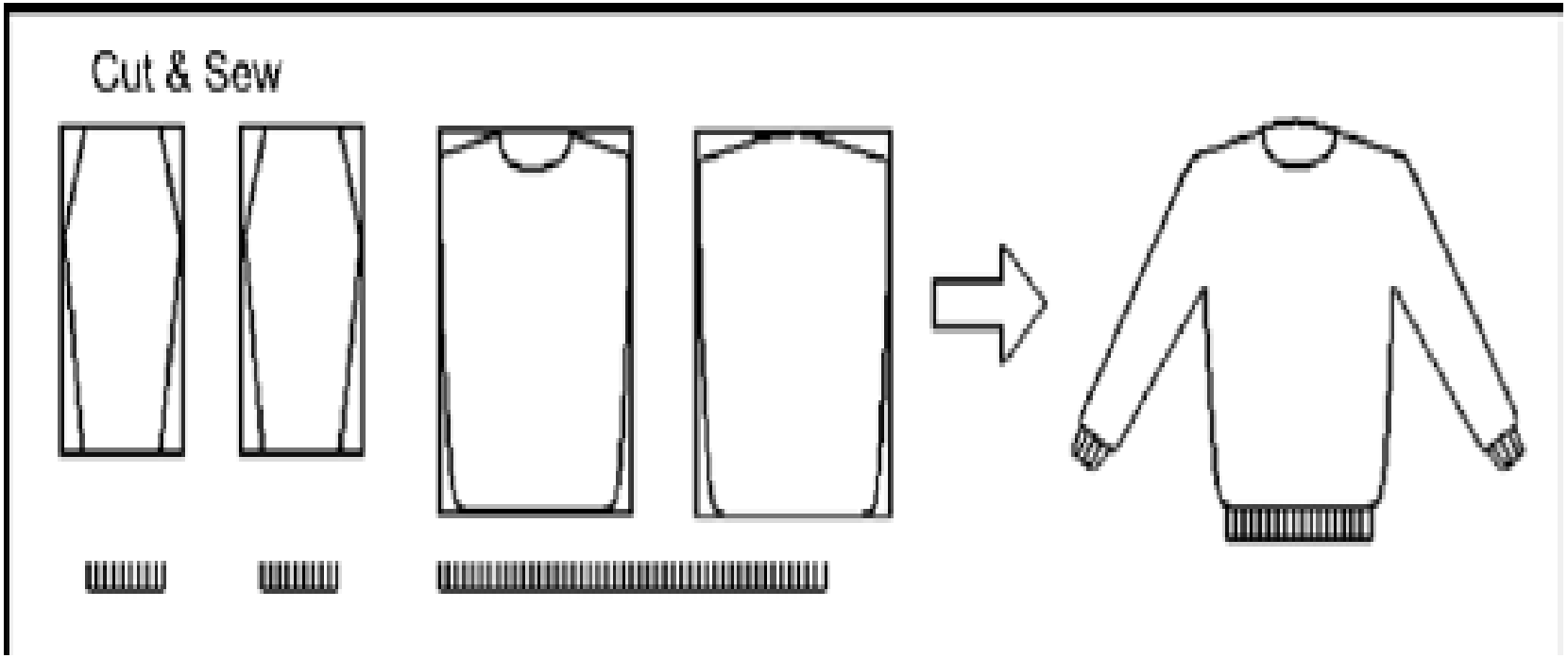
- Knitted garments can be classified on different basis as following:
  - On the basis of knitwear category
  - On the basis of knitting machine
  - On the basis of season of garments
  - On the basis of production technique
  - On the basis of end use
  - On the basis of gender of wearer

E.g. outerwear or innerwear, circular knit or flat knit, winter wear or summer wear, fully cut or fully fashioned, hosiery or apparel, menswear or women wear, etc

Knitted garments on the basis of production methods

- The production method means the steps of construction, the construction sequence and the technology involved in construction of a product. Thus, on the basis of this there are following four types of knitted garments:
  1. Fully cut knitted garments
  2. Stitched, shaped and cut knitted garments
  3. Fully fashioned knitted garments
  4. Integral knitted garments

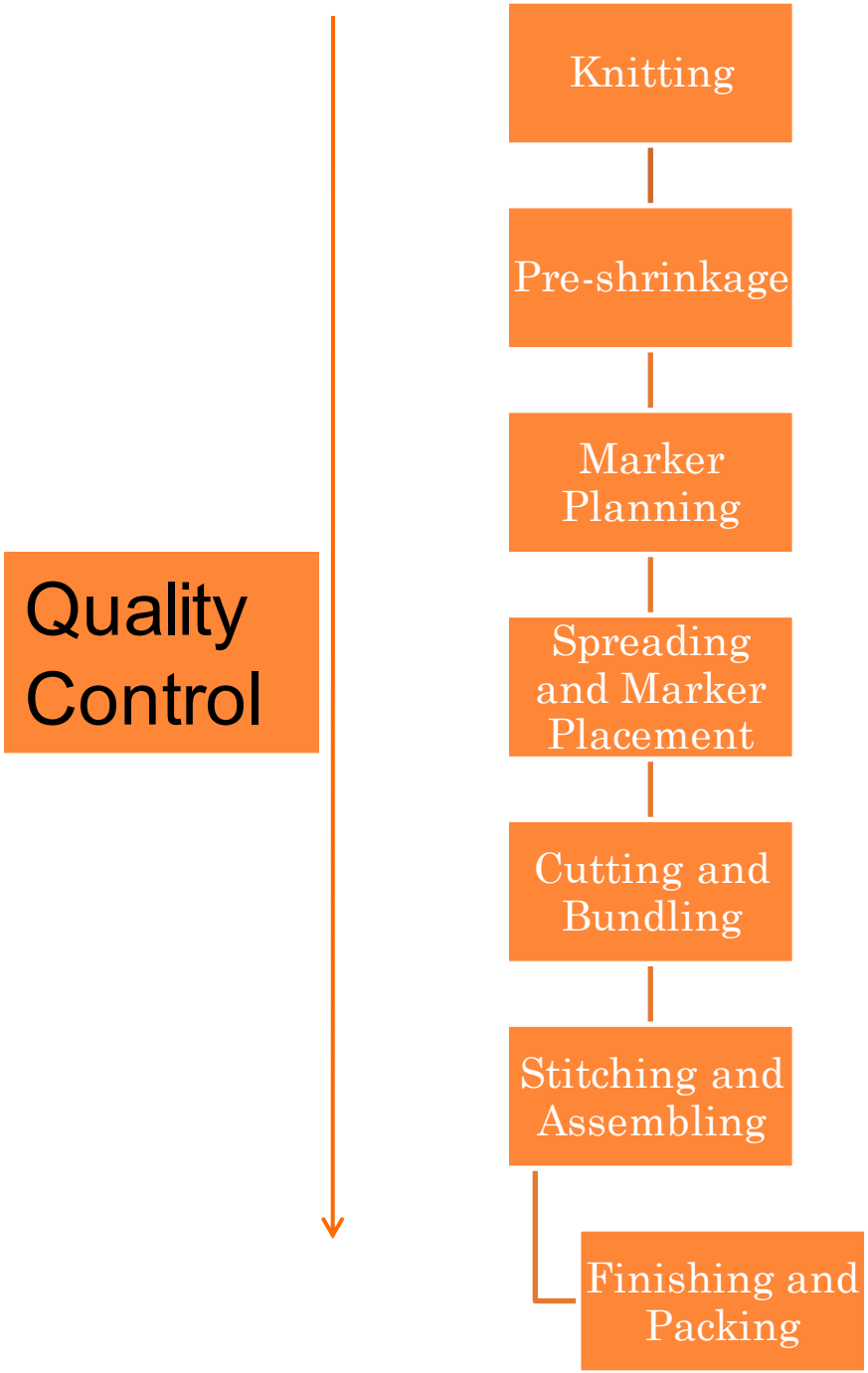
Fully cut garment



- The method of producing knitted garments just like woven garments including process like pattern making, spreading, cutting and stitching is known as fully cut production method.
- It is the oldest method of producing garments.
- It causes up to 30% cut loss of fabric, which is a wastage.
- It is the most versatile process of producing garments as a large variety of designs can be manufactured by this method.
- It does not need knitted machines to be placed at the time of garment production as fabric can be stored after knitting in factories.

Importance

- It provides a mean to produce a variety of designs in knitted garments.
- It is the most easy way of producing a knitted garment.
- It does not need to place knitted machines at the time of garment production as the knitted fabric can be stored in factories for future use.
- This method provides adequate quality garments.
- In this method the fabric can be washed prior to stitch into a garment and hence it will not shrink later on, giving it good quality for customer's use.



Production sequence of fully cut knitted garment

The production sequence of fully cut knitted garment is shown in the above diagram. It includes:

1. Knitting – The process of producing knitted fabric by intermeshing of loops of yarn.
2. Pre-shrinkage – The process of washing knitted fabric as per conditions to remove stress from fabric and to avoid post-stitch shrinkage in the garment is called as pre-shrinkage.
3. Marker Planning – The process of drafting patterns and arranging them as per fabrics dimensions and grainline for cutting is known as marker planning.

4. Spreading and Marker Placement – The process of laying the fabric flat on cutting table to make it ready for cutting is known as spreading. The process of placing the paper marker on top of the layer for cutting is known as marker placement.
5. Cutting and bundling – The process of cutting out garment parts from the layer with cutting instruments like straight knife, round knife, etc is called as cutting. The process of sorting and tying cut parts into groups as per their size for stitching is known as bundling.
6. Stitching and assembling – The process of sewing and joining cut parts into a garment is known as stitching and assembling.

7. Finishing and packing – The process of cleaning, pressing and attaching accessories and components to the stitched garment to make it ready for customer is known as finishing. The process of wrapping, folding and decorating garment into packs to make it ready for sale to customer is known as packing.

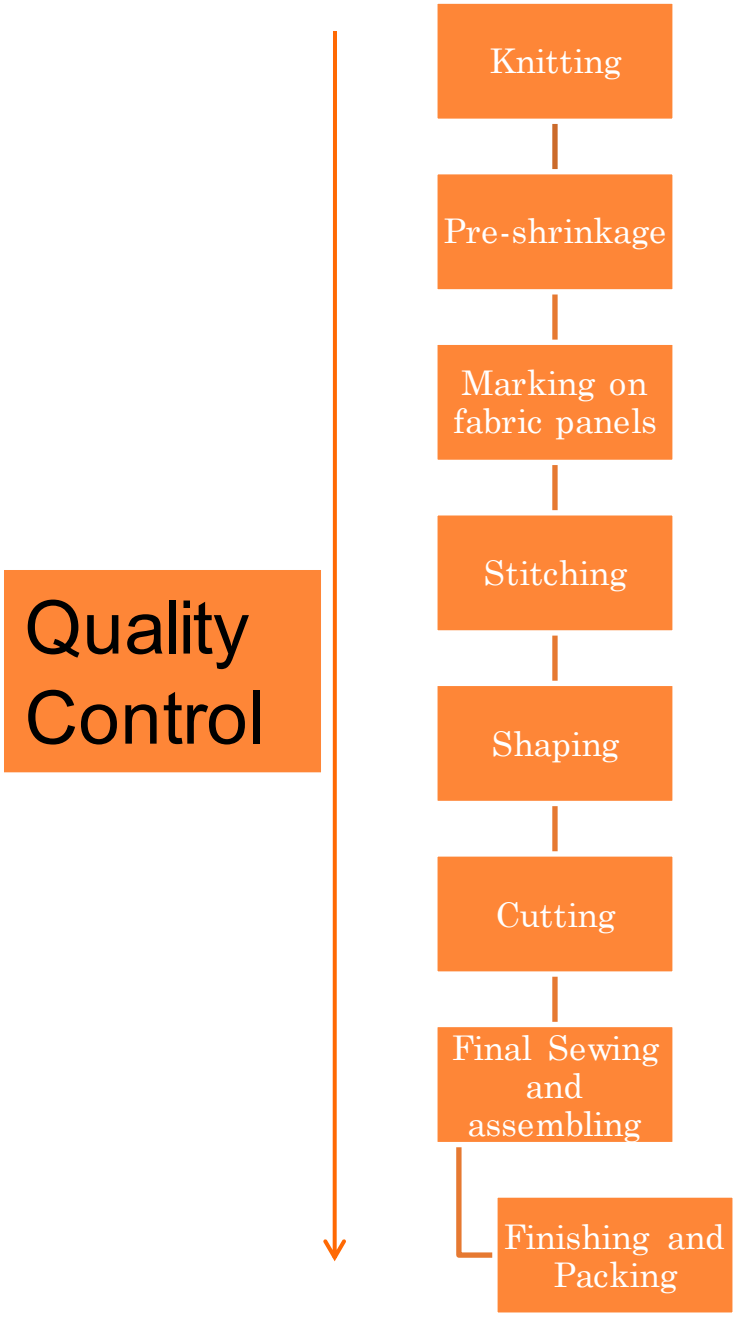
In this way a fully cut knitted garment is manufactured.

Stitched, shaped and cut knitted garments

- The process of manufacturing knitted garment by stitching the fabric panels first then shaping it at armholes, necklines and finally cutting and sewing it into final garment is called as stitch-shaped-cut knitted garment.
- The process also produces cut loss like fully cut garment method, which is a wastage.
- The process is less versatile than fully cut method.
- The process require more skill to shape garment than fully cut garment.

Importance:

- The process provides ease of handling knitted fabric during stitching. As knitted fabric has a tendency to curl on at edges so it becomes difficult to hold cut parts during stitching. This method solves the problem of handling as the panels are stitched first and then cut later on.
- The process avoids the need of pattern-making and marker placement as in fully cut method. As the pattern is directly transferred on fabric panels.
- It is useful for those knitted fabric structures which are highly unstable and have high tendency of curling.


Quality Control
Knitting
Pre-shrinkage
Marking on fabric panels
Stitching
Shaping
Cutting
Final Sewing and assembling
Finishing and Packing

The production sequence of stitched-shaped and cut garment is shown in above diagram. It includes:

1. Knitting
2. Pre-shrinkage
3. Marking on fabric panels – In this step the garment parts are marked directly on fabric panels for stitching.
4. Stitching – In this step the marked guidelines are followed on fabric panels for sewing and producing the base of a garment.
5. Shaping – In this process the parts like neckline, armhole, etc are shaped on the stitched fabric panels prior to cutting.
6. Cutting – In this step the extra fabric is cut out of fabric panel after shaping is complete.

7. Final sewing and assembling – In this step the garment is finally stitched and assembled to complete shape.
8. Finishing and packing

In this way a stitched, shaped and cut knitted garment is manufactured.

It should be considered that no preshrinkage is done in this garment and hence the garment should be manufactured remembering that it can shrink later on so it should include the extra measurements to counteract shrinkage later on.

FULLY FASHIONED KNITTED GARMENTS

- The knitted garments that are produced by the process of fashioning of loops in wales and courses on knitting machine itself and finally sewing them together is known as fully fashioned garments.
- These knitted garments decreases or completely remove the cutting step of garment production. Thus, it avoids cut loss wastage of fabric.
- Fashioning is the process of increasing or decreasing of loops in wales and courses of knit fabric to produce desired shapes in fabric for e.g. of armhole, of necklines, etc. It is done by counting no. of loops and increasing or decreasing them as per design or shape required.
- This method requires more skill than previous fully cut method as fashioning is carried out on machine which is a technical process.

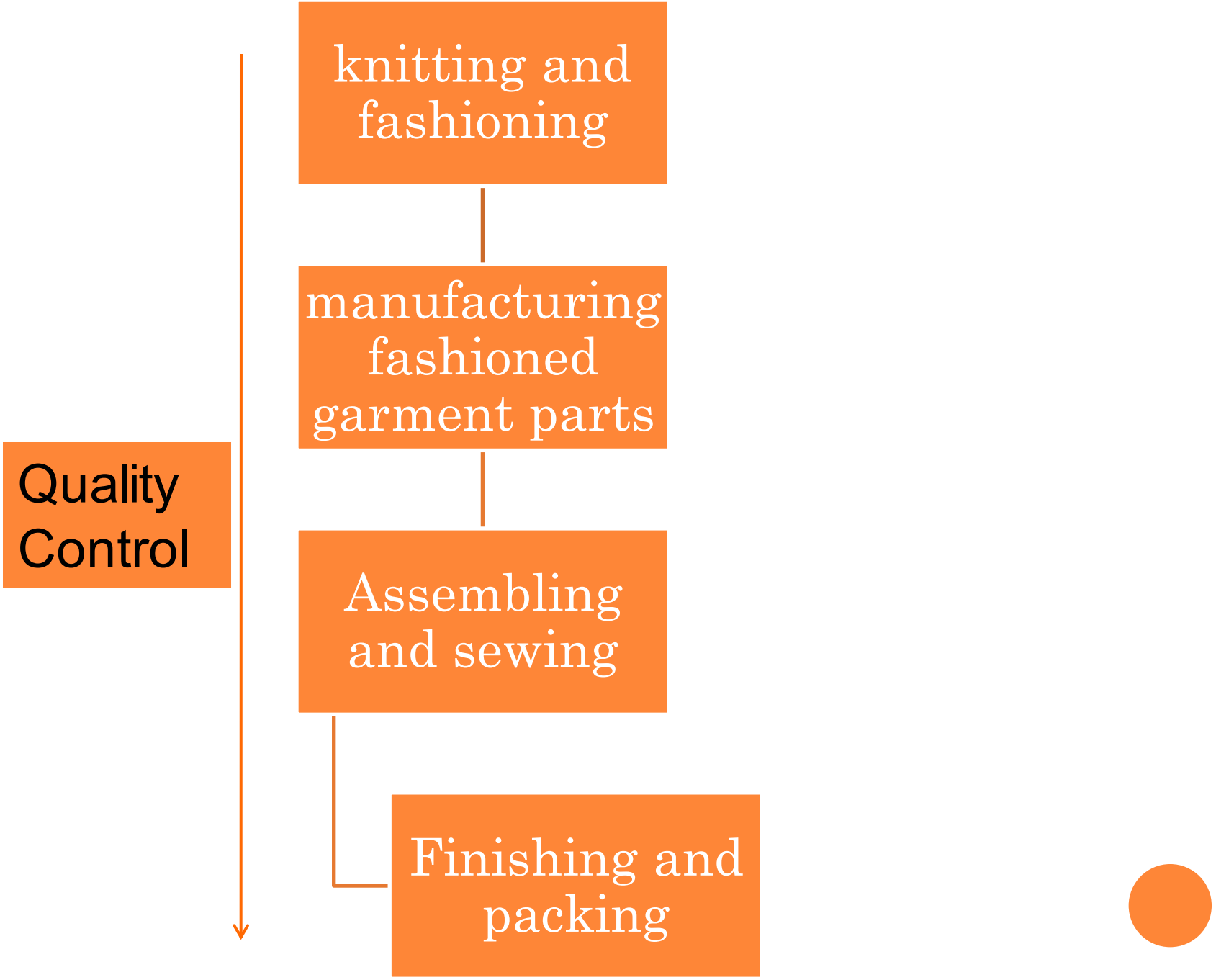
- This process is not as versatile as fully cut and only general designs are feasible to produce by this method.
- The process need knitting machines at the time of production as fashioning is done on machines. The fashioned panels can not be stored earlier like in case of fully cut garments. Thus the process takes more time than fully cut garments.

Importance:

- The fully fashioned garments are not cut but shaped or fashioned at edges of fabric to make armholes, necklines, etc. Hence, these garments provide more quality in terms of shape and fit.

- There is no cut loss or very minimum cut loss in this method. Hence, it reduces wastage of raw material in production. It reduces the effort of cutting in production.
- The fully fashioned garments are outcome of development in knitted technology and hence providing scope for better technique, quality, efficiency and utilization of raw materials.

Production Sequence:


knitting and fashioning
manufacturing fashioned garment parts
Assembling and sewing
Finishing and packing
Quality Control

The production sequence of fully fashioned garments can be understand with the above diagram. It includes:

1. Knitting and Fashioning – It includes the process of increasing and decreasing loops in wales to shape the edges of fabric during knitting as per design.
2. Manufacturing the shaped garment parts – It includes producing complete garment parts with shaped edges ready for stitching. It is done with the help of fashioning process.
3. Assembling and Sewing – The fashioned garment parts are finally joined and stitched together to produce a knitted garment.
4. Finishing and Packing – The complete garment is then finished with accessories, components, pressing, etc to make it ready and decorative for sale to customer.

INTEGRAL GARMENTS

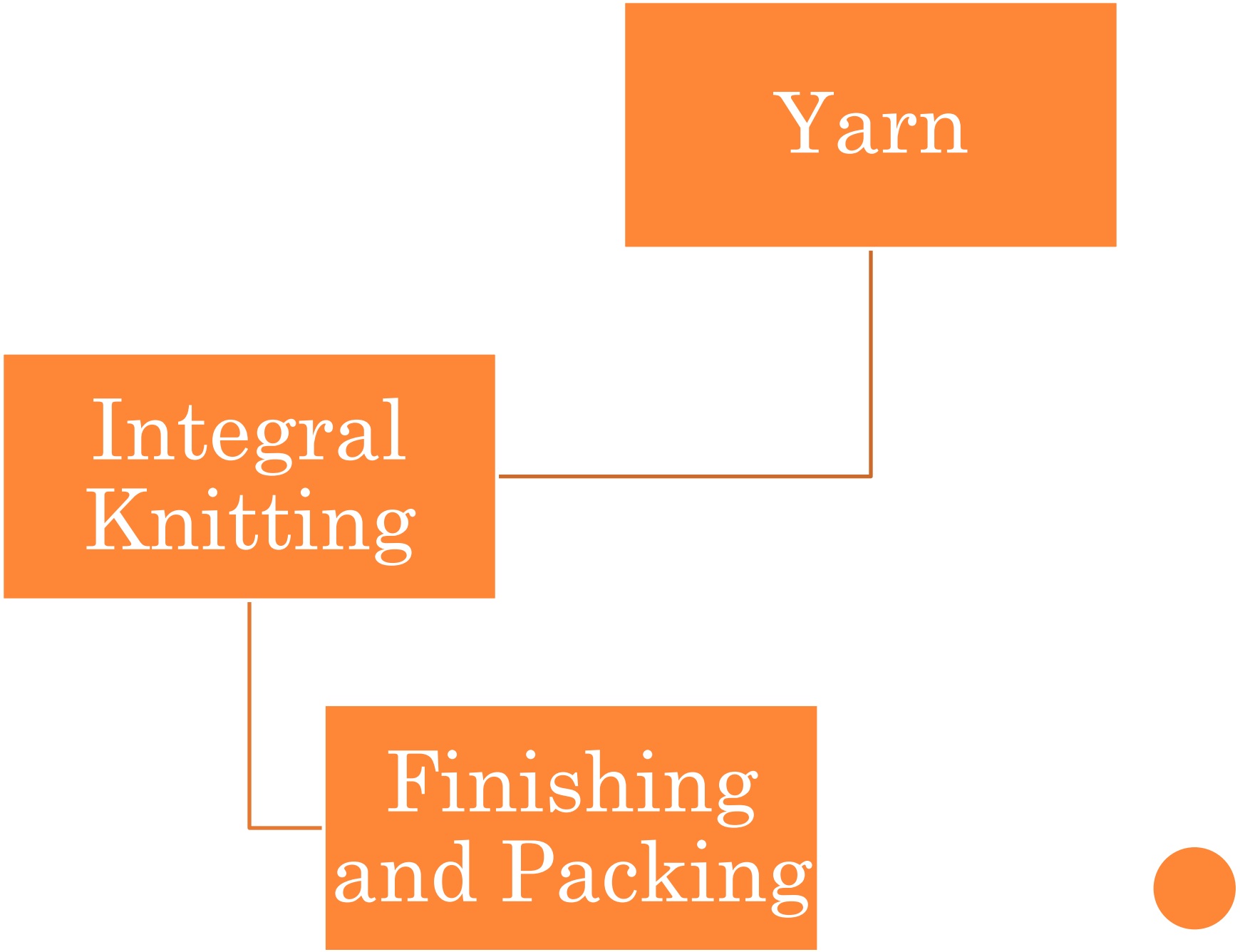
- The garments that are manufactured as completely through knitting on machines and removing cutting and stitching operations are called as integral garments.
- These garments are generally seamless garments.
- This method is least versatile among all the four methods and is used to produce very general and body fit garments. Like swim suit, gymnast dress, etc.
- It requires good technical skills to design such garments on machine.
- It produces best quality in terms of fit and performance. It is very costly but saves cut loss wastage. Also , it saves effort of cutting and sewing.

Importance:

- It provides one stop solution for knitted garment production.
- It saves cut loss wastage.
- The garments should be manufactured considering the post knitting shrinkage in garment to avoid size miss match.
- This is the latest technique of knitted garment production and has given a scope to eliminate traditional processes like cutting and stitching completely from garment production.
- It also includes fashioning process i.e. increasing or decreasing of loops in wales to design desired shape in knitting.

- It is the most expensive method of garment production.

Production Sequence:


Yarn
Integral Knitting
Finishing and Packing

- Quality control – In all the four methods the quality control is very important part of production as it ensures following:
  - Correct Measurements
  - Correct knit stitches
  - Correct design features
  - Correct shape
  - Correct quality parameters
  - Correct end use
  - Correct raw material selection

  Thus, to ensure the desired garment features to customer it is very important to keep a check on all steps of production which is called as quality control.

Handling precautions of knitted fabric during spreading

Knitted Garment Tech

III Semester, Fashion Tech

Spreading

- The process of unfolding fabric package and laying down the fabric on cutting table according to required length to prepare a spread ready to cut is known as spreading of fabric.
- The spreading can be done manually or with the help of spreading machine.
- The spreading of woven fabrics is easy compared with spreading of knitted fabrics as knitted fabrics has tendency of stretching and curling.
- Thus, the spreading of knitted needs certain precautions to be followed which are as following -

1. The knitted fabric package has knitted fabric in tense and stretched condition. Hence, the knitted fabric is first unfolded from the package and laid down on table for 24 hrs in standard environmental conditions which allows it to **relax** and return it into original dimensions.
2. The knitted fabric is difficult to handle during spreading and hence it is required to pull it while spreading without any tension. The **rate of spreading** of knitted fabric should be slower than that of woven fabric.
3. The knitted fabric has its **face and back side** having completely different look. Thus, the side of fabric should be carefully checked during spreading to avoid any face-back reversal.

4. The knitted fabric has **higher tendency of shrinking** than woven fabric. Hence, it should be pretested before spreading so that we can add the margin during spreading or it should be washed first before spreading.
5. The knitted fabric is made of loops having a specific direction. Thus, during spreading the **direction of loops** should be carefully checked to avoid any reversal of loops design in garment.
6. The knitted fabric **is bulkier** than woven fabric and hence the number of layers should be kept lesser than woven fabric in order to avoid poor quality of cutting.
7. The knitted fabric is a network of loops interconnected with each other. Thus, during cutting it may be possible that the fabric becomes **distorted**. If the fabric is limp or thin, it is suggested to add fusing before spreading.

8. The **length and width** of fabric must be at least equal to marker length and width.
9. Any **faults** identified on the incoming fabrics will be tagged and will be avoided.
10. **Ply tension** must be uniform and as much less as possible.
11. Polythene sheets are used under the bottom ply to resist **friction of the bottom ply** with the base plate of the knife.
12. Fabrics must be flat and free from any **wrinkle and crease**. These cause defect in garments due to variation in dimension.
13. **Checks and stripes and designs** should be matched.
14. **Manual spreading** is preferred as machine spreading can add tension to plies.
15. **Tubular knitted fabrics** need more careful handling than flat knit fabrics.

Suitable stitches for knitted garments (402, 406, 407, 602, 603, 604, 605, 607, 608)

Knitted Garment Tech

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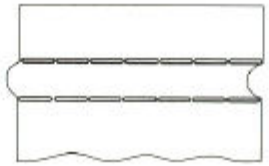
402 Three Thread

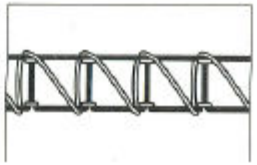
The 402 cording stitch

- 2 needle threads that produce two parallel rows of stitching on the face of the fabric.

- Examples:
  - Used for stitching permanent creases

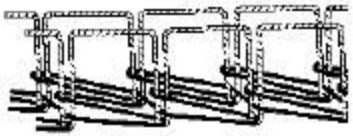


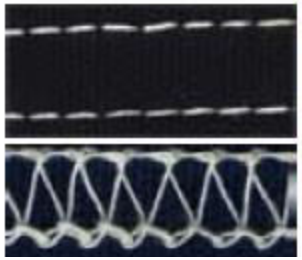
(Narrow Needle Spacing)



402 Cording Stitch for Permanent Creases

406

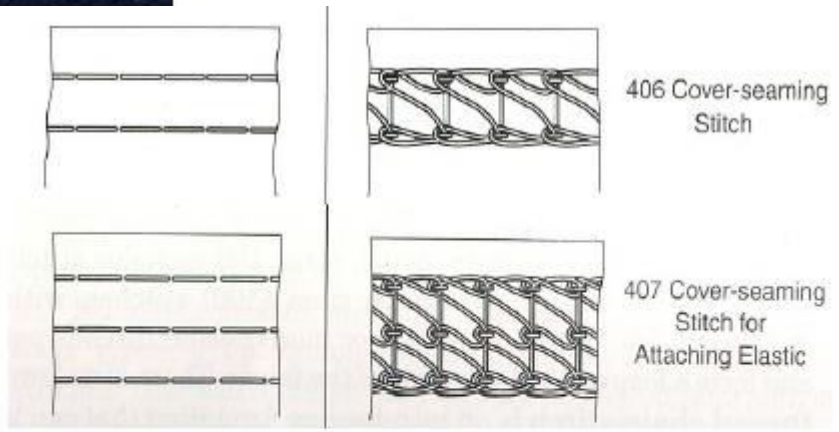




ISO# 406 Bottom Coverstitch

Stitch formed by 2 needle threads passing through the material and interlooping with 1 looper thread with the stitch set on the underside of the seam. Looper thread interlooped between needle threads, providing seam coverage on the bottom side.

- The 406 and 407
- Cover stitches:
  - See <Sample>
  - Examples:
    - The 406 is used to form hems on knit garments, necklines of T-shirts, and attach bindings on men's brief's.
    - The 407 is similar except 3 needle threads and has more stretch. (e.g. for undergarments).

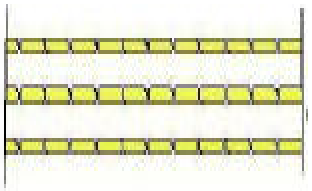
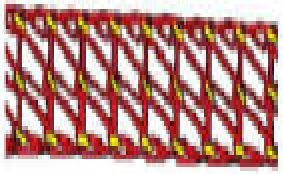


2 Needle Bottom Coverstitch	Looper Thread on Bottom	406			
			Hemming, Attaching, Elastic, Binding, Coverseaming, Making Belt Loops	Specify 1) Needle spacing (1/8", 3/16", 1/4") 2) SPI	Stitch formed by 2-needle threads passing through the material and interlooping with 1-looper thread with the stitch set on the underside of the seam. Looper thread interlooped between needle threads providing seam coverage on the bottom side only.

407

ISO# 407 Bottom Coverstitch

Stitch formed by 3 needle threads passing through the material and interlacing with 1 looper thread with the stitch set on the underside of the seam. Looper thread is interlooped between needle threads, providing seam coverage on the bottom side only.

3 Needle Bottom Coverstitch	Looper Thread on Bottom	407	Attaching Elastic to Men's & Boys Knit Underwear	Specify 1) Needle spacing (1/4") 2) SPI	Stitch formed by 3-needle threads passing through the material and interlooping with 1-looper thread with the stitch set on the underside of the seam. Looper thread is interlooped between needle threads providing seam coverage on the bottom side only.
					

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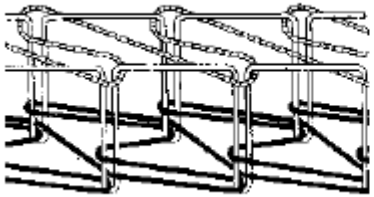
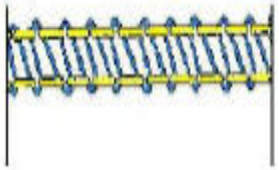
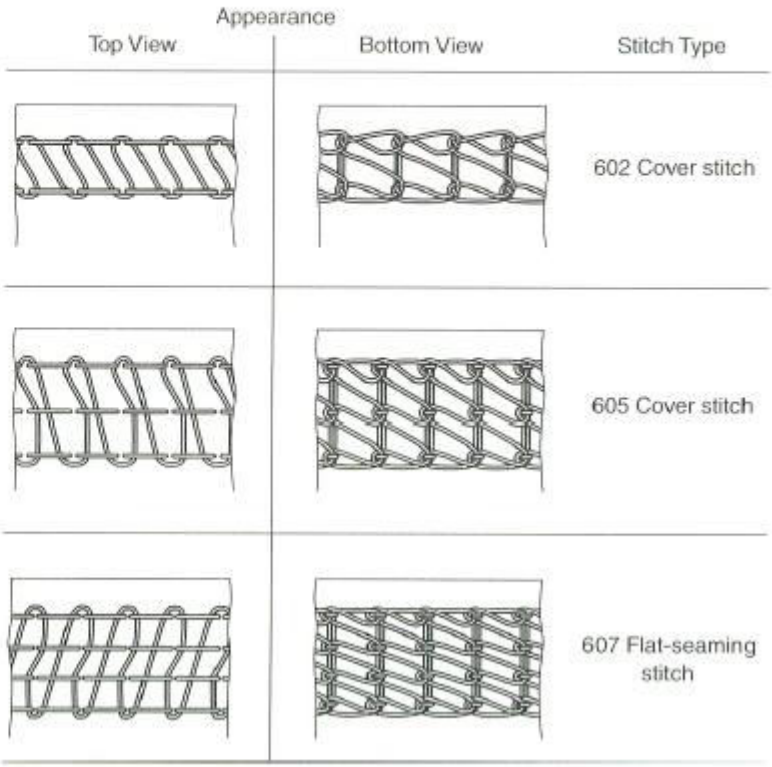


ISO# 602 Coverstitch
Formed with 2-needle threads, a top cover thread and a bottom looper thread.

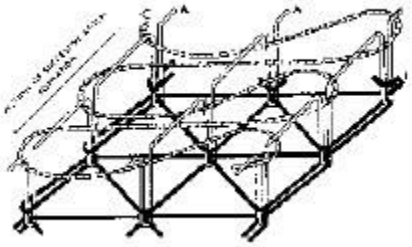
2 Needle 4 Thread Coverstitch 		602	Binding A Shirts, Infants Clothing, etc.	Specify 1) Needle spacing (Ex: 1/8", 3/16", 1/4") 2) SPI	Stitch formed with 2-needle threads, a top cover thread and a bottom looper thread.

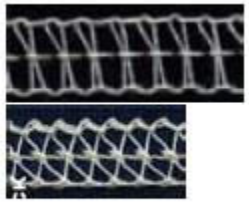
CLASS 600- COVER STITCH

- The 602, 605, and 607
  - Strong, elastic stitches to cover raw edges and prevent raveling.
  - Example uses:
    - knits and lingerie
    - The 607 for infant's panties

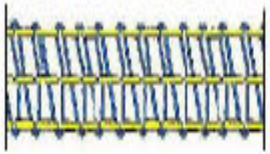


605



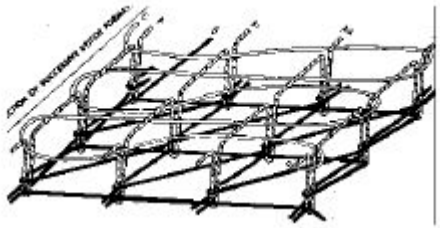


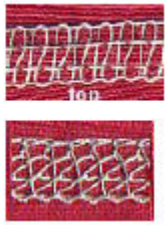
ISO# 605 Coverstitch
Formed with 3-needle threads, using a top cover thread and a bottom looper thread.

3 Needle 5 Thread Coverstitch 		605	Lap Seaming, Coverseaming, Binding on Knits	Specify 1) Needle spacing (Ex: 1/4") 2) SPI	Stitch formed with 3-needle threads, a top cover thread and a bottom looper thread.

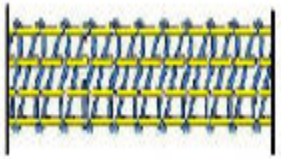
601 Three Thread
603 Five Thread
604 Six Thread
606 Nine Thread

607





ISO# 607 Coverstitch
Formed with 4-needle threads, a top cover thread and a bottom looper thread.

4 Needle 6 Thread Coverstitch 	Flatseamer/Flatlock 	607	Flat or Lap Seaming Knit Underwear, Fleece, etc.	Specify SPI	Stitch formed with 4-needle threads, a top cover thread and a bottom looper thread. Preferred over 606 stitch because machines are easier to maintain.