Introduction to Knitting…..

The process in which fabrics are produces by set of connected loops from a series of yarns in weft or warp direction is called knitting. The basic element of a knitted fabric structure is the loop intermeshed with the loops adjacent to it on both sides & above & below it.

Historical Background of knitting technology:

1589: William Lee, inventor of the mechanical stitch formation tools. 1758: Jedeish strutt, inventor of double-knit technique

1798: Monsier Decroix, Circular knitting frame.

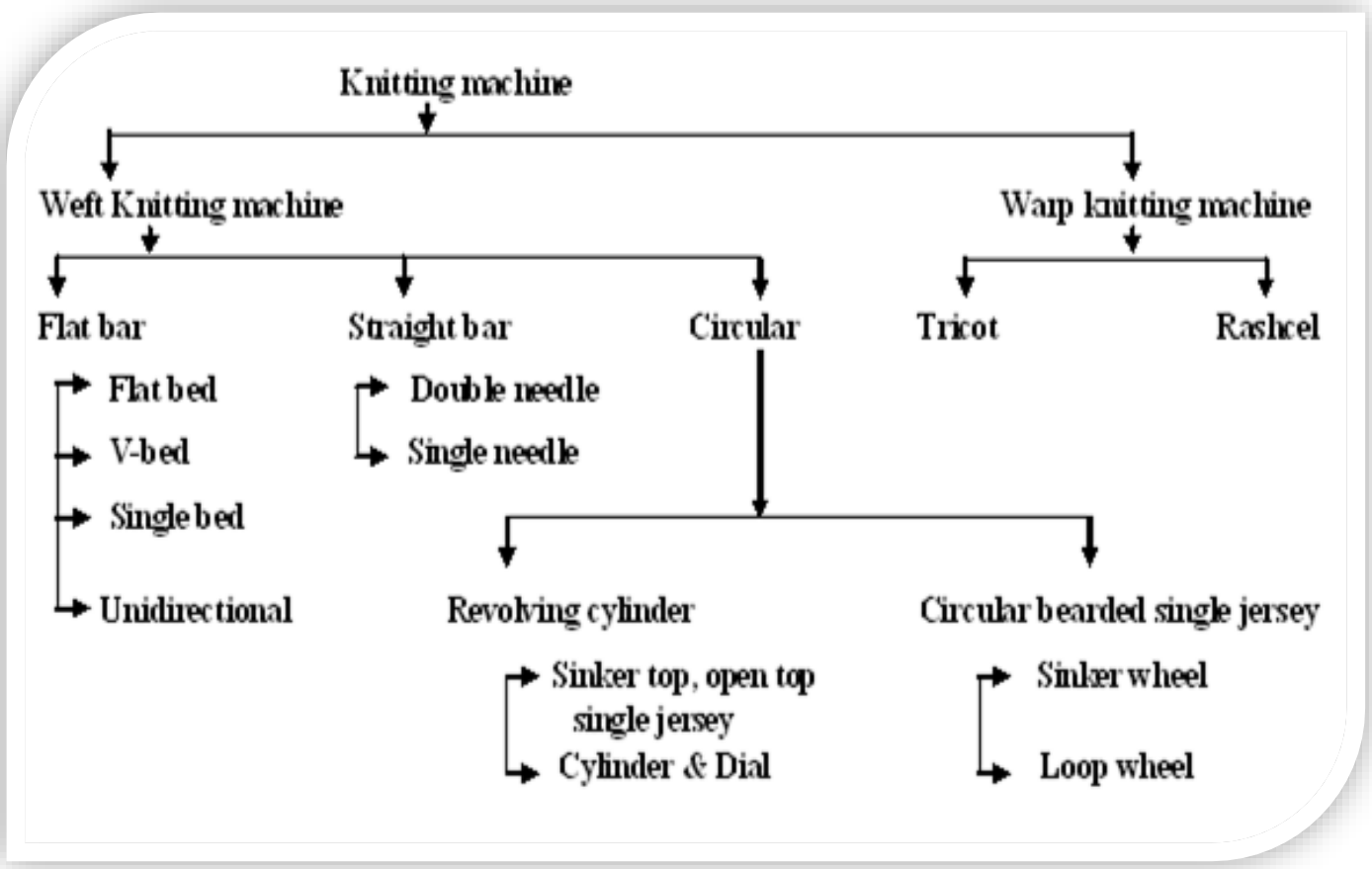
1805: Josheph Marie Jacquard, Jacquard mechanism. 1847: Mathew Townsend, inventor of latch needle.

1850: Circular knitting machine 1852: Needle development.

1878: Circular knitting machine plain rib. 1910: Interlock fabric.

1918: Double headed or hook latch needle. 1920: Pattern wheel, punch tape etc.

Classification of knitting machine:

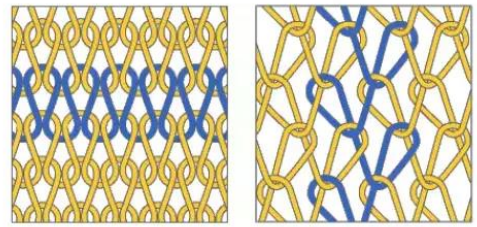


Weft knitted fabric

- When fabric is produced by the loop formation in weft directionthen it is called weft knitting.
  In weft knitted structure a horizontal row of loops can be made using one thread & the thread runs in horizontal direction

Warp knitted fabric

- In a warp knitted structure each loop in vertical direction is madefrom a different thread & the number of threads used to produce such a fabric is at least equal to the number of loops in horizontalrow.



Course

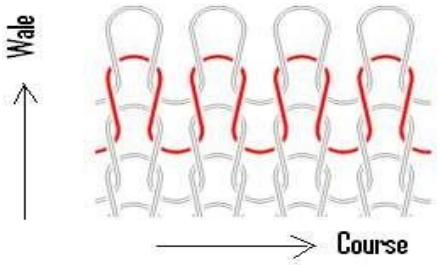
The number of horizontal rows of loop of knitted fabrics is called course. In a weft knittedfabric a course is composed of yarn from a single supply termed a course length.

CPI= Courses per Inch

Wale

The number of vertical columns of loop of knitted fabrics is called wale. In warp knitting awale can be produced from the same yarn.

WPI= Wales per Inch



Stitch density

The term stitch density is frequently used inknitting instead of a linear measurement of courses & Wales.

It is the total number of needle loops in a square area measurement such as a square inch or square centimeter.

Stitch density= Wales per inch (wpi) x Courses per inch (cpi).

Kink of yarn:

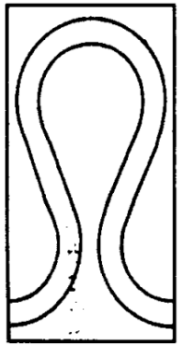
A length of yarn that has been bent into a shape appropriate for its transformation into a weft knitted loop.

Knitted loop:

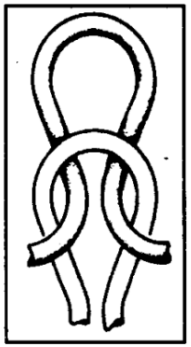
A kink of yarn that is intermeshed at its base i.e. when intermeshed two kink of yarn is called loop.

Knitted stitch:

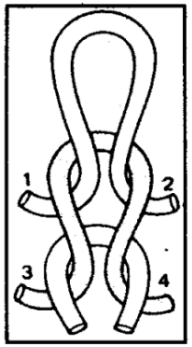
Stitch is a kink of yarn that is intermeshed at its base and at its top. The knitted stitch is the basic unit of intermeshing and usually consists of three or more intermeshed loops, the centre loop having been drawn through the head of the lower loop which had in turn been intermeshed through its head by the loop which appears above it.



Kink of yarn



Knitted loop



Knitted Stitch

Top arc:

The upper curved portion of the knitted loop is called top arc.

Bottom half-arc:

The lower curved portion that constitutes in a weft knitted loop, half of the connection to the adjacent loop in the same course.

Legs or side limbs:

The lateral parts of the knitted loop that connect the top arc to the bottom half-arcs.

Needle loop:

The needle loop is the simplest unit of knitted structure. Needle loop formed by the top arc and the two legs of the weft knitted loop

Needle loop= Top arc+ Two legs

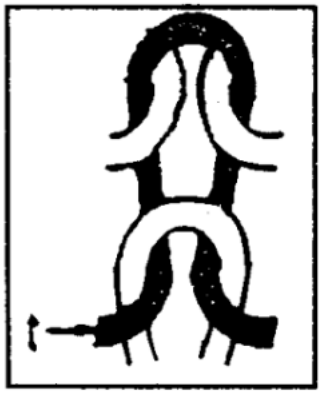
Sinker loop:

The yarn portion that connects two adjacent needle loops belonging in the same knitted course. Bottom arc also called sinker loop.

Loop or Stitch length:

The length of yarn knitted into one stitch in a weft knitted fabric. Stitch length is theoretically a single length of yarn which includes one needle loop and half the length of yarn (half a sinker loop) between that needle loop and the adjacent needle loops on either side of it. Generally, the larger the stitch length the more elastic and lighter the fabric, and the poorer its cover opacity and bursting strength. It is sometimes denoted as S.L or simply SL and measured in mm unit.

Stitch Length, s.l = one needle loop+ two half a sinker loop.



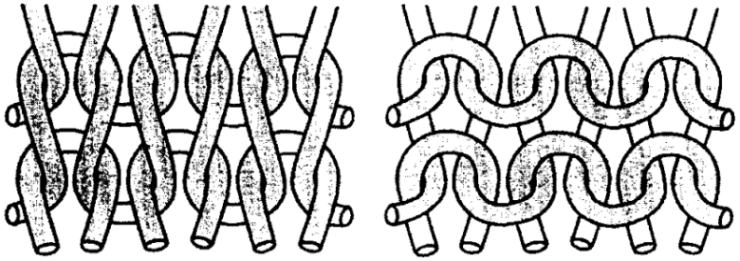
Stitch length

Face loop or stitch:

Also called plain stitch or jersey stitch or flat stitch. A stitch that is so intermeshed in the fabric that its legs are situated above the top arc of the stitch formed in the same wale in the previous course. This side of the stitch shows the new loop coming through towards the viewer as it passes over and covers the head of the old loop. Face loop stitches tend to show the side limbs or legs of the needle loops or over laps as a series of inter fitting "V s".

Reverse or back loop or stitch:

A stitch that is so intermeshed in the fabric that the top arc and the bottom arcs are situated above the legs of the stitch formed in the same wale in the previous and in the following course. This is the opposite side of the stitch to the face loop side and shows the new loop meshing away from the viewer as it passes under the head of the old loop. Reverse stitches show the sinker loops in weft knitting and the under laps in warp knitting most prominently on the surface.



Basic elements of knitting:
There are three basic elements of knitting, such as **needle, cam and sinker**.

The Needles:
The fundamental element in construction of knitted fabrics is the knitting needle. Needle is the main knitting tools and also the principal element of machine knitting. During yarn feeding the hook is opened to release the retained old loop and to receive the new loop which is then enclosed in the hook. The new loop is then drawn by the hook through the old loop which slides on the outside of the bridge of the closed hook.

According to working process knittingneedle are two types:

1. Independent needle (Work Individually).
2. United needle (Work all together).

There are hundreds and hundreds of different shapes of knitting needles used for

production of knitted loops but all of them can be grouped in three main needle types:

1. The spring-bearded needles
2. The latch needles and
3. The compound needles.

Machine or needle gauge:

The needle gauge of a knitting machine (also called cut or gage) is a measure expressing the number of needles per a unit of the needle bed (bar) width.

Gauge, G = How many needles are used in one English inch.

$$G = \frac{Number\ of\ needles}{one\ english\ inch}$$

Highest needle gauge is about 60 and lowest needle gauge is about 2 to 2.5.

Needle pitch:

The needle pitch is the distance between two neighboring needles in the same needle bed (bar), from the centre of a needle to the centre of the neighboring needle.

Relationship between the needle gauge and the needle pitch is as follows:

Needle pitch (Length units /needle) = 1 /Needle gauge (length unit)

The pitch or distance between one needle and another is proportional to the needle gauge or thickness and therefore to the space available for the yarn. As the diameter of a yarn is proportional to its count, a relationship exists between the range of optimum counts of yarn which may be knitted on a particular machine and its machine gauge. Machine gauge thus influences choice of yarn and count, and affects fabric properties such as appearance and weight.

Needle Specifications:

For example: Vota 78.60 G.02

- The capital letter at the beginning of the word (“V”), identifies the number of butts and the type of tail.
- The first part (78 in the example) indicates the whole length rounded off to the mm.
- The second (.60 in the example) part indicates the gauge of the needle in hundredths of mm (width of the needle).
- The first capital letter (G) indicates the needle manufacturer (G for Groz-Beckert).
- The next number (02) is used to distinguish a specific needle among all the needles produced by the same manufacturer.

Calculation of needle:

Total number of needles= πDG

Here D= Diameter of knitting machine in Inch

G= Machine Guage

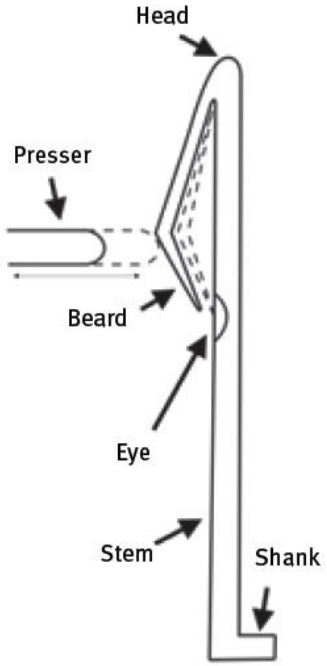
Calculate the Machine Guage of a circular knitting machine with 30 Inch Diameter and 2640 needles.

(Answer: 28)

The Spring-Bearded Needles:

The spring-bearded needles made of steel wire consist of the following parts:

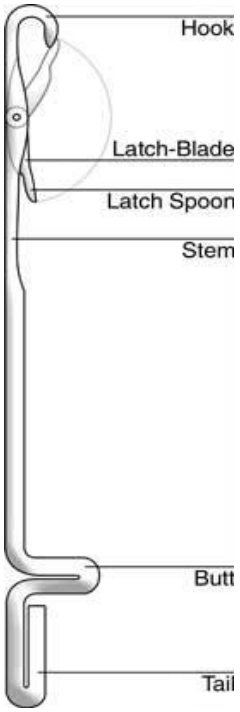
1. The Stem: The stem around which the needle loop is formed.
2. The Head: Where the stem is turned into a hook to draw the new loop through the old loop.
3. The Beard: Which is the curved downwards continuation of the hook that is used to separate the trapped new loop inside from the old loop as it slides off the needle beard.
4. The Eye or groove: Cut in the stem to receive the pointed tip of the beard when it is pressed, thus enclosing the new loop.



The Latch needle:

The latch needle has a rigid hook and a latcheasily around the.

1. Hook: This draws and retains the new loop.
2. Slot: This receives the latch blade.
3. Slot wall: which are either punched or riveted to fulcrum the latch blade.
4. Rivet: This fixed the latch in the slot walls.
5. Latch blade: This locates the latch in the needle.
6. Latch spoon: This is the extension of the blade& bridge the gap between the hook & stem.
7. Stem: Carries the loop in the clearing or rest position.
8. Butt: Cam act on it to reciprocate the needles.



Characteristic of latch needle:

- ✓ Most widely used in weft knitting.
- ✓ More expensive than bearded needle.
- ✓ Automatic work.
- ✓ Work at any angle.
- ✓ Needle depth determines the loop length.
- ✓ Except raschel machine, they are placed in groove or tricks.

Uses:

- ❖ Mostly used in weft knitting machine
- ❖ Double cylinder machine.
- ❖ Simple flat bar machine
- ❖ Warp knitting raschel machine.

Why Latch needle is called self-acting needle????

Compound Needle:

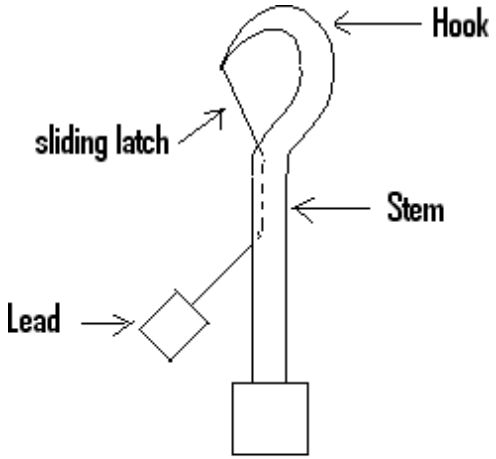


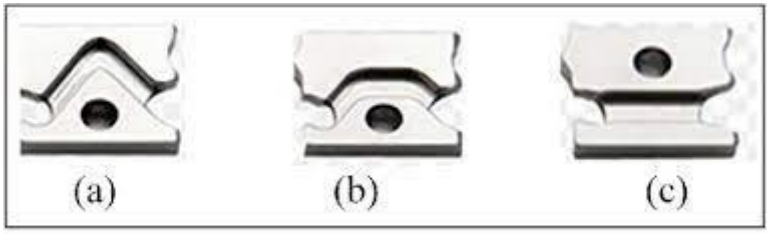
Fig:Compound needle

The Cams:

Cam is the second primary knitting element. The cams are the mechanical devices which convert the rotary machine drive into a suitable reciprocating action for the needles or other elements. The cams are of two types, Engineering cams and Knitting cams.

The knitting cams are divided in to three groups, such as

a) **knit cam**
b) **tuck cam**
c) **and miss cam**.



Sinker:

sinker is the second primary knitting element. It is a thin metal plate with an individual or collective action approximately at right angles from the hook side between adjoining needle.

Function

a) Loop formation
b) Holding down.
c) Knocking over.