

Knitting Needles Machines

Heart of Knitting



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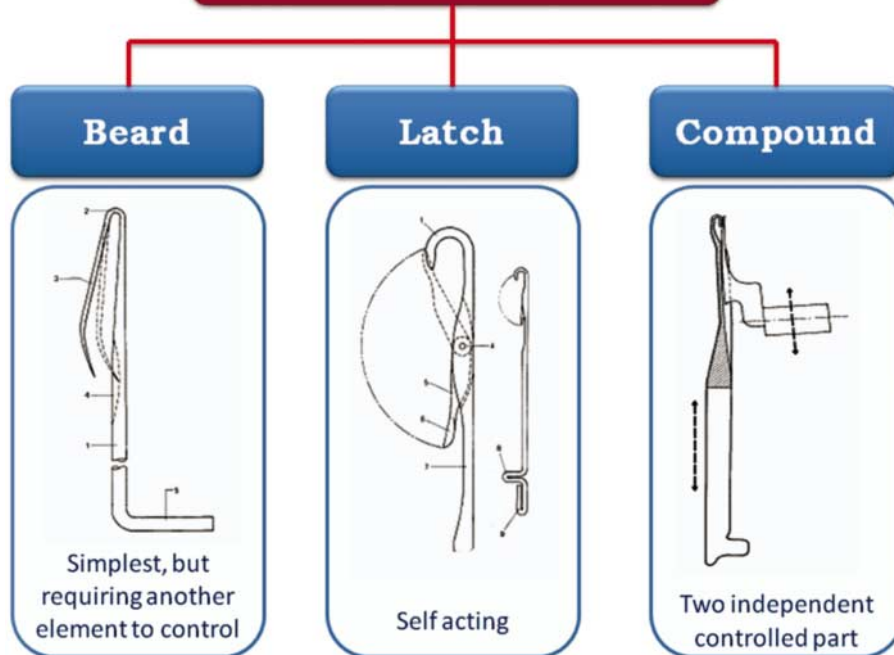
The fundamental elements in construction of knitted fabrics are the knitting needles as they are the main elements for intermeshing of loops. The quality of the knitted fabric is largely dependent on the effectiveness and accuracy of the loop, which in turn largely depends on the needle.

Small variations in the needle manufacture can lead to irregular fabric. The surface of needles should be highly polished allowing the yarn and the loop to slide free. The needle must have high strength and toughness to give durability. A typical needle must perform several million knitting actions without fault.

Types of knitting needles: There are three types of needles. These are:-

1. Bearded needle
2. Latch needle
3. Compound needle

Types of Needles



The Latch needle is primarily used in weft knitting, and the other two are used for warp knitting. A coarse (large and thick) needle usually knits with a coarse yarn (large hook), whereas a fine (small and thin) needle usually knits with fine yarn (small hook).

Bearded needle

The bearded needle was used by William Lee in his stocking frame to enable a single needle to undertake the tasks achieved by hand knitters with two needles. This needle is the simplest and cheapest to produce, but it does require an additional element to close the beard during knitting. In the case of warp knitting it is a presser bar. The majority of modern high speed warp knitting machines now use compound needles rather than bearded needle.

The needle consists of five main parts.

- 1. Shaft or stem** – used with the jack sinkers to form new loops
- 2. Head** – the point at which the stem is bent to form the beard, it helps to draw the new loop through the old loop
- 3. Beard** – the needle continues from the head to be turned back on itself to form the beard. The beard is used to trap new loops while old loops are pushed over the top

- 4. Groove or eye** – a small groove is worked into the stem of the needle to allow the beard to fit flush with the stem and ensure the old course is pushed over the beard

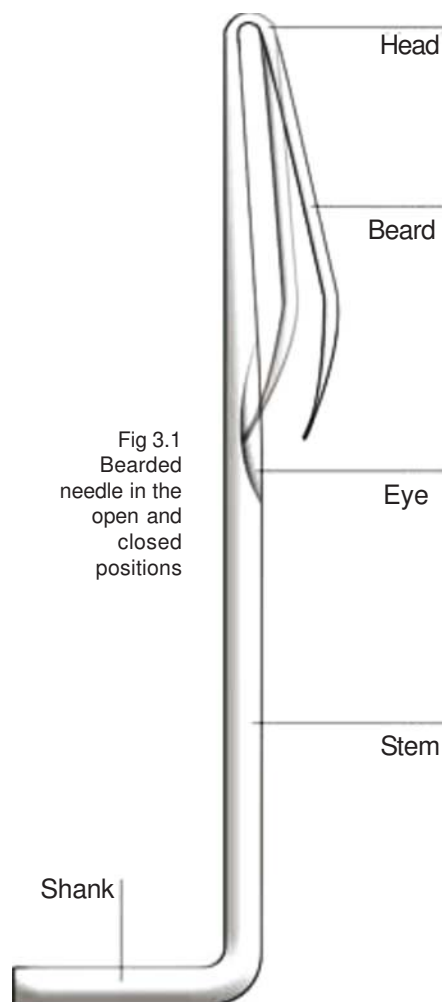


Fig 3.1 Bearded needle in the open and closed positions

- 5. Shank** – bent for individual location in the machine or cast with others in a metal 'lead'. The shank is used to attach the needle to the frame

Bearded needle characteristics

1. The knitting section occupies a considerable amount of space, thus limiting productivity
2. The needles can set vertically or horizontally
3. The needle has the disadvantage of requiring a pressing edge to close the bearded hook
4. The presser may be in the form of a bar, blade, verge or wheel
5. Finer in Cross Section, therefore, more needles in unit space. Hence Finer Gauge (60 needles/per inch) can be achieved
6. High wear and tear and can break easily
7. Strain on the yarn is less
8. No possibility of fluff or lint accumulation on the needle
9. Most of the warp knitting machines use beard needles

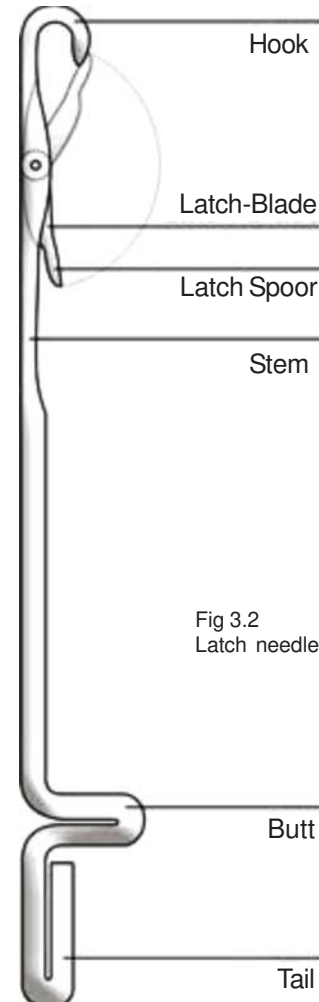
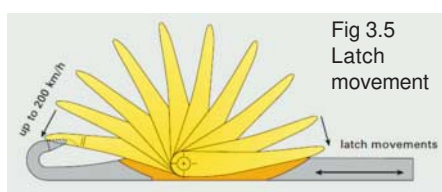
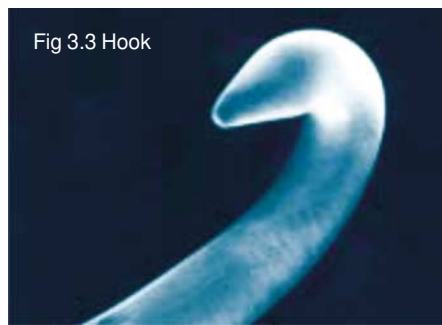


Fig 3.2 Latch needle



Latch needle

Matthew Townsend, a Leicester hosier, patented the latch needle in 1849, and compared to the bearded needle, which evolved some 260 years earlier, it has the advantage of being self acting, though it is slightly more expensive to produce.

The needle consists of seven main parts:

1. **Stem** – Used to hold the course of old loops
2. **Hook** – The hook is used to catch a thread and form loops
3. **Rivet** – The rivet, which may be plain or threaded, holds the latch in place and allows it to pivot
4. **Latch** – The latch combines the task performed by the presser bar and the beard of the bearded needle
5. **Latch spoon** – The latch spoon is an extension of the blade, and bridges the gap between the hook and the stem covering the hook when closed
6. **Butt** – The butt enables the movement of the needle to be controlled by a cam mechanism. A track raises and lowers the needle
7. **Tail** – Used to provide support to the needle

Latch needle characteristics:

1. Most widely used in weft knitting
2. More expensive than the bearded needle, because of the assembly of the needle and latch
3. It is self-acting or loop-controlled, and is sometimes termed the ‘automatic’ needle
4. It can work at any angle
5. Needle Depth determines the loop length
6. Variation of the height of reciprocating action produces knit, tuck or miss stitch
7. It is ideally suited for use with computer-controlled electronic selection devices
8. It makes a longer stroke in the cycle of knitting
9. The Latch needle takes a longer time to knit a loop and hence the knitting machine is generally found slower
10. Latch needles are thick and rigid
11. Needle deflection is difficult
12. It imposes a certain strain on the yarn
13. There is also a possibility of fluff or lint accumulation on the latch due to rubbing action of the yarn on the needle

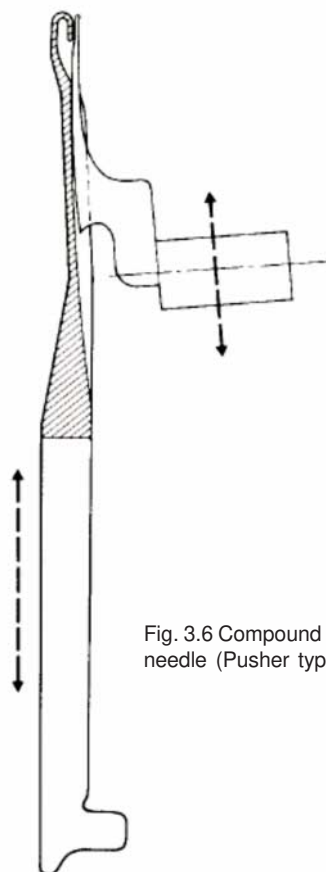


Fig. 3.6 Compound needle (Pusher type)



Fig. 3.7 Compound needle (Tubular pipe)

Compound needle

Compound needles were designed in the mid of 19th Century. It consists of two separately controlled parts; these are the open hook and the sliding closing element (tongue, latch, piston, and plunger). The two parts rise and fall as a single unit but at the top of the rise, the hook moves faster to open the hooks and at the start of the fall the hook descends faster to close the hook. It is easier to drive the hooks and tongues collectively to form two separate bars as in warp knitting; than to move each hook and tongue individually as in weft knitting.

Two types of compound needle have been employed in warp knitting machines:

1. The open stem “Pusher type” or slide needle has a closing wire or tongue that slides externally along a groove on the edge of the flat hook member
2. The tubular pipe needle has its tongue sliding inside the tube of the open hook

Compound needle characteristics:

1. The compound needle is expensive
2. It offers a much shorter, smoother and simpler knitting action in comparison to other needles
3. Both members of Compound Needle have a straight moment, thus the knitting speed can be increased
4. There is no strain on the yarn

Common points

The three needles considered above, while differing in design, have the following points in common.

1. **Hook** – to take & hold newly fed yarn
2. **Closing mechanism** – to allow the held loop to leave the needle
3. **Stem**
4. **Control Butt** – for individual or collective movement

Loop formation process

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 (As shown in Fig. 3.8). The new loop is then drawn by the hook through the old loop which slides on the outside of the bridge of the enclosed hook (As shown in Fig. 3.9). All needles must therefore have some method of closing the knitting needle hook to retain the new loop and exclude the old loop (As shown in Fig. 3.10).



Fig 3.8



Fig 3.9



Fig 3.10

Needle orientation

Needles in the knitting machine are usually oriented either vertically, horizontally, or at 45°. Needles are held in the position by needle beds - pieces of metal into which slots or grooves have been cut. The beds can be rectangular or circular.

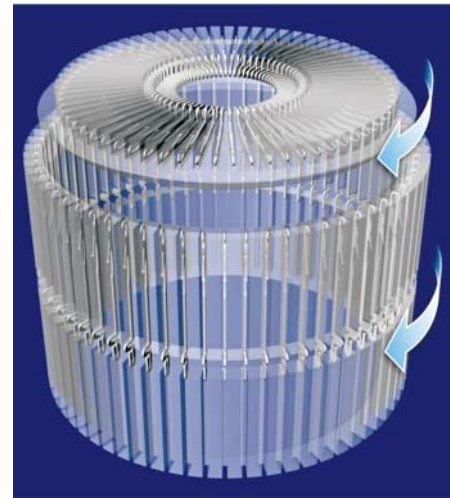


Fig 3.11 Needles at 90° on cylinder (Vertical) and dial (Horizontal)

Comparison of needles

Bearded needle	Latch needle
Required another element to close the hook	Self acting needle
Less expensive	More expensive
Beard needles are thin and flexible	Latch needles are thick and rigid
Usually mounted on finer gauge	Usually mounted on coarser gauge
It wears and breaks easily	Strong in nature
No strain on yarn	Imposes certain strain on yarn
It makes a shorter stroke in the knitting cycle	It makes a longer stroke in the knitting cycle
Stitches are tight and minimum loop robbing	Stitches are loose
No fly and fluff generation	Due to rubbing, fly and fluff generation is high
Time required to knit the loop is less	Takes longer time to knit the loop
The speed of the machine is high	The speed of the machine is less

Latch needle Compound needle

Self acting needle	Consist of two separately-controlled parts
Less expensive	Very expensive
Preferred for Weft Knitting	Preferred for Warp Knitting
Vibration is more	Short, smooth, simple harmonic movement, so there is less vibration
Yarns are under stress	No stress on yarn
The vertical clearing height is very good	The vertical clearing height is not so good
Latch needles produces the long & narrow loops	The needle can knit tight, uniform stitches that tend to be rounder
Latch needles are relatively thick	Because of its slim construction and short hook fine warp knitted are possible
Speed is relatively less	Can work at high speed

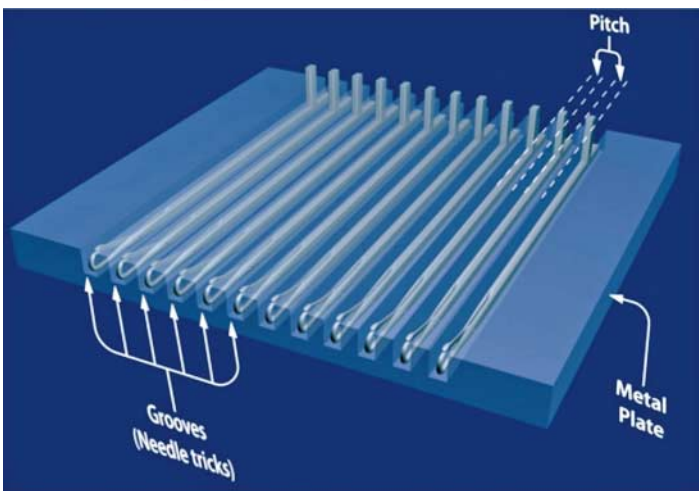


Fig 3.12 Needles at rectangular or flat bed

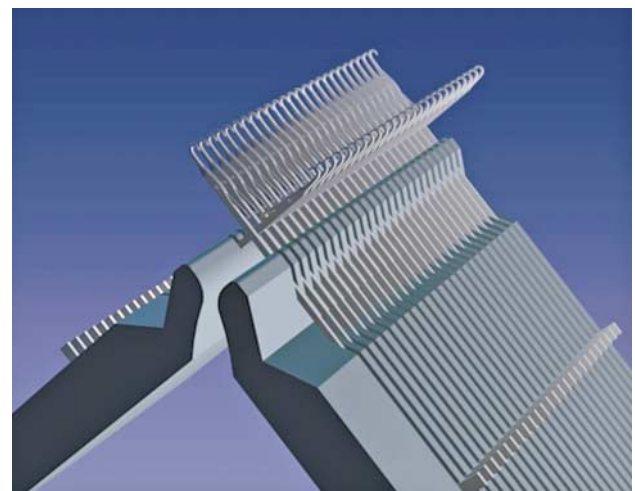


Fig 3.13 Needles at 45° on V Bed Knitting Machine

In the next session, we would be discussing about the elements of knitting.