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Tailoring and Dress Designing • Apparel and Textile Design

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Apparel and Textile Design



NETAJI SUBHAS OPEN UNIVERSITY



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Unit 3 □ The Sewing Machines

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3.0 Objectives

After going through this unit you shall be able to know—

- The different parts of a sewing machine.
- The different types of needles.
- The different types of stitch and sewing threads.

3.1 Introduction

At present it is known to all that people of ancient period used to wear clothes that were not stitched together at all.

Gradually after a long time in Aryan period women wore the sari with a blouse or choli under the sari but such blouses were not stitched as the art of sewing was unknown at that time and also men wore dhoti with turbans.

Ultimately after a long period, the concept and ideas of people were gradually changed through the knowledge of hand embroideries and discovery of looms and sewing machines in developed countries.

The designers, manufacturers and retailers improved their views and knowledge through attending in the international trade fairs, Exhibition and fabric stalls of various countries like France, Italy, West Germany, China etc. They tried to manufacture ready to wear garments for mens, womens and children and also arranged to sale their products in retail stores of big cities. Now, the garments of Asian, European countries and Indian dresses like Dhoti, Sari, Scraf, blouse and turban have never been disappeared and peoples are still using but the main point is that due to change of outlook, the styles and quality of the product has been improved through research and development and introduction of synthetic fibres as well as blending system with natural fibres in international level.

In India, garment markets gradually tried to improve after 1960 and onwards through technological development like introduction of Dobby and jacquard looms, high speed power looms, spinning frames and introduction of various types of sewing machines, embroidary machines, etc.

So, inthe very beginning to study the subject and also to clear the views practically we should learn about sewing room technology and all the allied terms including necessary equipments used to fullfill the purposes.

3.2 Sewing

In clothing manufacture, the important process in garment assembly is sewing. It is the best way to impart strength and flexibility in the seam itself as well as for smooth functioning the manufacturing processes.

So purposes of sewing are the construction of seam for the appearance and better performance with the limited cost of production.

A seem of good appearance means smooth fabric joins having no uncomfortable ridges and missed or uneven stitches to the material being sewn.

In garment manufacturing, the sewing room technology deals with the following :

1. The stitch type
2. The seam type
3. The stitching machine
4. The choice of needle i.e. selection of needle
5. The choice of thread.

3.3 The Stitch and its types

Stitch types and classification is based on structure of the stitch and the process of interlocking.

Stitch quality depends on end use. To satisfy the consumers desire for performance and aesthetics, stitch quality must be good.

Defination of Stitch : According to ASTM D6193 the term defines that A stitch is the configuration of the interlacing of sewing thread in a specific repeated unit.

A stitching consist of a series of stitches embodied in a material for oranmental purposes or finishing an edge or both.

Kind of Stitch : Stitches can be done both in hand like manually or in sewing machine.

The first sewing machine was brought into market in 1889 by Singer and Co.

It offers both hand, treadle (foot operated) and electrically operated machines for sale and supply in apparel industry.

Sewing machines can make a variety of plain or decorative stitches.

Among all, plain stitches fall into three categories like chain stitch, lock stitch, overlock stitch.

Again decorative stitches are the categories used in embroidery work for decoration and surface ornamentation.

Embroidery is one of the ancient technique of textile decoration as well as surface ornamentation. India carries a tradition of decorative and colourful hand embroidery stitches throughout its various states as the over all effect and beauty of art and craft enlighten people from the very beginning.

At present, the embroidery stitches can be ornamented in embroidery machines also.

Among the well known decorative stitches some of them are used in various embroidery works like

Applique in Orrisa, Kantha in West Bengal, Phulkari in Punjab, Chikankari in U.P., Ari in Rajasthan, Kutchi in Gujrat etc.

The overall decorative stitches can be classified into the following categories like

Outline stitches : The type of stitches are used in this case are Run, Chain, Back, Cross, Stem, Button hole and Dul stitch.

Filling stitches : The type of stitches are used in the filling purposes as, Satin, Herring bone, Fishbone, Button hole, Kashmiri, Gujrati etc.

Knot stitches : French knot, Button knot.

3.3.1 The lock stitch

It sews a straight seam on the same principle as in home sewing machine.

The machine makes it possible for the top thread to go under the bottom thread around a bobbin creating a lock. The main advantage is that this is the most secure stitch possible but it leaves an unfinished seam, this is the main disadvantage of this machine.

Another drawback in that time wastage frequently to rewind the bobbin as it contains a limited length of thread. Lock stitch which is important in top stitching as well as seam joining of facings, collars, pockets and many other similar type of garment parts.

3.3.2 The chain stitch

It makes a series of loops pulled through one another. It works on the same principle similar to crocheting.

The top needle goes in and out of the fabric making loops underneath that catch into one another.

The chain stitch is not so secure like lock stitch. Here, the operator does not need to stop the machine during the operation to rewind the bobbin as the machine does not have a bobbin.

3.3.3 The overlock (or serging) stitch

It runs on the same principle as the chain stitch and is not secure as lock stitch.

In an operation it sews the fabric together and cut off the fabric end to make a smooth edge and overlocks around the edge. It is based on one needle and two loopers with three spools or cones of thread.

This type of stitch is fit and ideal for the knitted garments as it imparts stretch of the fabric.

In spite of the above three types, there are another two types like

3.3.4 Safety overlock stitch

It is the combination of the chain stitch and the overlock. It provides straight chain stitch plus an edge finish. So, it has dual functions in one.

3.3.5 The blind stitch

It is based on the principle of chain stitch.

3.4 Seam and the purpose of seam finishes

A seam is a line of stitching of joining together two or more pieces of fabric. The purpose and function of seam is very important in garments construction. The main role of seam is to hold two pieces fabric together as it gives shape and structure of the garment.

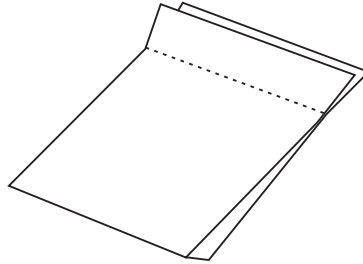
As per ASTM D6193 classification, a seam is a line where two or more pieces of fabric are joined by stitches.

Seam can be classified as

1. **Conspicuous seam** : In Conspicuous seam, the stitches can easily be seen from the right side of the garment. It gives extra strength as well as used for decoration. Example : Lapped seam, Lapped felled seam, etc.
2. **Inconspicuous seam** : In this case stitches can not be seen from the right side of the garment. Example : French seam, Plain seam etc.

So, the purpose of seam is purely functional and used for decorative purposes & garment design. Among the various types of seams the following are mostly used : Plain/Flat seam, Lapped seam, French seam, Bound seam, Channel seam, Lapped felled seam.

Plain seam/Flat seam : Plain seam is most widely used for the joining fabrics of average weight.



At plain seam should be used on all woven fabrics and mainly used for side seam.

Lapped seam : It is the simplest type of seam and formed by lapping two pieces of fabric in garments. It is used in the sleeve of shirt, punjabi, jeans etc.



French seam : The importance of French seam is that it binds the raw edges as fraying does not occur. It is a type of narrow seam.



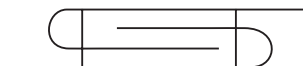
This type of seam is used on medium weight of fabric for the production of childrens clothes and lingerie.

Bound seam : Bound seam is formed by folding a separate binding strip over two or more prices of fabric through one or two rows of stitches. Bound seam generally used as an edge finish like Hem, Necklines, Sleeves, Plackets etc.



Lapped felled seam : It is most commonly used on garments like jeans and in

the armhole of shirt. It sewn two rows of stitches on a twin needle machine and that provides a strong seam.



Purpose of Seam finishes : Seam finishes are made as it encloses the raw edges of the fabric to prevent fraying and also to make the seams more durable as well as for the neat appearance of the garment.

3.5 Sewing Machine

Two types of sewing machines are generally used as home and traditional factories as follows :

- (1) Domestic type of sewing machine, which is either operated by hand or foot.
- (2) Power sewing machines.

Three main types of power sewing machine are used in traditional factory, which depends on type of stitch and belongs to

- (1) The lock stitch machine,
- (2) The chain stitch machine,
- (3) The over lock or serging machine.

A sewing machine is no more than a power operated needle, with other mechanism in synchronization. Here, the operator controls the size of the stitch, the tension of the sewing threads and the rate of stitch formation. The operator also controls the shape of the sewing line and hence the shape of the finished garment part.

The choice between a portable and a table model is a matter of space available in the house. Portable power sewing machine found very effective and simple to use.

There are many machine manufacturers like USHA, SINGER, BROTHER, JUKI, DARKOP-ADLER, Tazima, Shima/Seiki, PAFF etc. of which JUKI, BROTHER, PAFF etc. modern sewing machines are mostly used in garment manufacturing industry.

A modern power sewing machine is of such type that not only performs its plain sewing but also does piping, binding, Ruffles, pleats, even making button holes and attaching fustener etc.

3.5.1 Different Models of Sewing Machine

In fashion garment manufacture and for more specialised garment production in large volume, which depends on variation in machine shape that enable easier movement of the flow of materials movement around the machine.

The machine shape means the shape of the bed of the machine that is the part on which the material rest.

There are various models of sewing machine like Flat bed, Cylinder bed, Post bed and Feed off the arm.

The most popular is the Flat bed as it is used in the majority of sewing where a large and open garment part can easily be handled around the needle and much flat surface for sewing.

Cylinder and post bed are used where the parts to be sewn are small, curved in shape.

3.5.2 Different manufacturing companies of Sewing Machine

(1) JUKI, (2) Brother, (3) Darkop-Adler, (4), Pegasus, (5) Tazima, (6) Union Special, (7) Eastman special, (8) Summit, (9) Paff, (10) ZSK, (11) Matsuga, (12) Shima/Seiki.

3.5.3 Basic features of an ordinary domestic Sewing Machine

- In ordinary domestic (hand/foot operated) sewing machine stitching rate about 800 stitches/min. Whereas a modern sewing machine stitching rate of 9000 stitches/min.
- It is generally single needle machine.
- Only lock stitching.
- In this case no button hole making or button stitching facilities in corporated.
- In this case stitch control is not possible.
- Manual lubrication.
- Here, no provision of bare tack stitches.

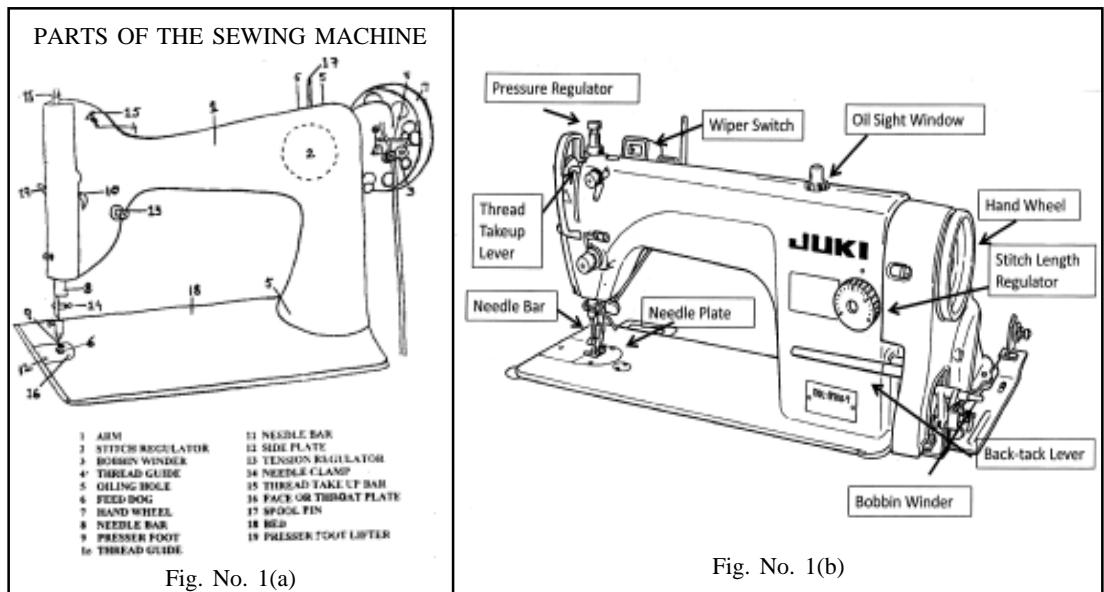
3.6 Different equipments used in clothing construction room

- [1] **Seissors** : There are various types & sizes of scissors including embroidery scissors and button hole scissors for cutting different length of button holes. Scissors of 5"—6" long are used for light cutting, trimming etc.
- [2] **Shears** : It is used for giving notch marks. In pinking shears, it is designed with blade and notched edges of 8"—10" long.
- [3] **Measuring tape/Tailors tape** : For measuring length and width in cm., inch or metre.

- [4] **Ruler :**
- [5] **Hem marker :**
- [6] **French curve :** It is used to measure armhole and necklines.
- [7] **Tailor's square :** For 90° and 45° Angles.
- [8] **Tracing wheel :** A small serrated hand wheel used to copy a pattern piece and also to mark.
- [9] **Hip curve :** It is a tool used to measure the hip portion.
- [10] **Pin and Pin cushions :**
- [11] **Needles :**
- [12] **Tailors chalk :**
- [13] **Seam Ripper :** It is used for ripping seams easily and safely.
- [14] **Thimble :** It is safety aid used at the time of hand sewing for directing the needle through the fabric with the protection of finger. A hard material for properly fit in the finger.

3.6.1 Different parts of a High speed single needle lock stitch industrial Sewing machine.

Different parts of a sewing machine are noted below as shown in Fig. No. 1(a) and the view of JUKI (SNLS) as shown in Fig. No. 1(b).



Head : The complete sewing machine without cabinet or stand.

Arm : The curved part of the head containing the mechanism for driving the needle and handling the upper thread.

Spool pin : It is the upright metal rod fitted on the top of the arm to hold the cotton thread reel.

Oiling Hole : It is the holes over the surface of the top arm for pouring oil to the inner machine parts as per schedule/necessity.

Stitch regulator : The regulator fixed on the machine through which stitch density is regulated according to the type of the cloth. Hence, the length of stitches is determined by the graduation marks.

Bobbin winder : The mechanism through which the thread is wound in bobbin just for quick filling the bobbin.

Hand wheel : The wheel at the right of the head driven by a belt or handle.

Thread guide : The thread passed over the guide.

Thread cutter : It is the blade fastened to the side of the presser foot bar.

Thread take up bar : It is a lever fitted to the body of the arm located above the tension regulator. At the outside end of the lever there is a small hole through which the thread passes.

There are two functions of the lever.

(i) To feed the thread to the needle. (ii) to lighten the loop formed by the shuttle.

As the lever moves down it releases the thread to interlock with the bobbin thread then as it rises it lightens the thread to form a firm stitch.

Tension regulator : It is the mechanism fixed to the body for controlling the pressure of the thread as it passes between the discs and the pressure of the thread is adjusted by a spring and a nut.

Needle bar : It is the upright bar at the lower end of which the needle is attached.

Feed dog or feed : It is a small metal device with teeth which carries the material i.e. the fabric as it is stitched. When the machine is in motion the feed dog moves upwards thus advancing the material as each stitch is made.

Presser foot : It is a detachable device for holding the material in place on the feed while stitching. This device is not used when attachments such as tucker, ruffler or binder are used.

The Face or Throat plate : This is a semicircular disc with a highly polished surface and a hole in it to allow the needle to pass through it.

The fundamental purpose of this plate is to provide a levelled surface for the cloth/material and to prevent dust.

The Treadle : It is the foot operated device fitted in the lower part of sewing machine for running the machine through foots.

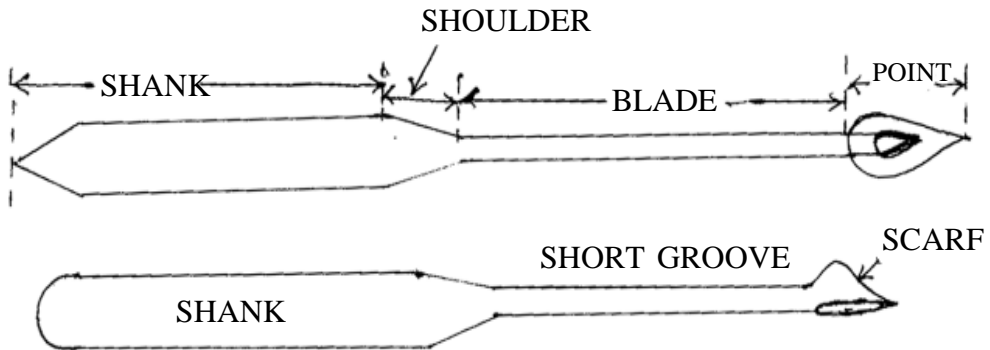
3.6.2 Different parts of a sewing machine needle

Sewing needle : Needles come in packages of branded company of different sizes as well as different needle no's.

Selection/choosing needles based on (a) Type of fabric that is light or coarse, (b) Thread size is count of sewing thread, (c) The type of stitch.

Sharp needles have small round eyes ; crewel needles have long eyes which are easily threaded.

Long needles are convenient for long stitches small/jine needles are better than the larger needles and used in case of hems, hand gathering etc.



Different parts of a sewing machine needle

Fig. No. 2

Shank : It is the upper part of needle which is located within the needle bar for support.

Long groove : A protected channel in which thread is drawn down the material.

Eye : Hole extending through the blade from long groove on oneside to short groove on the other.

Point : It is shaped for the penetration through the material.

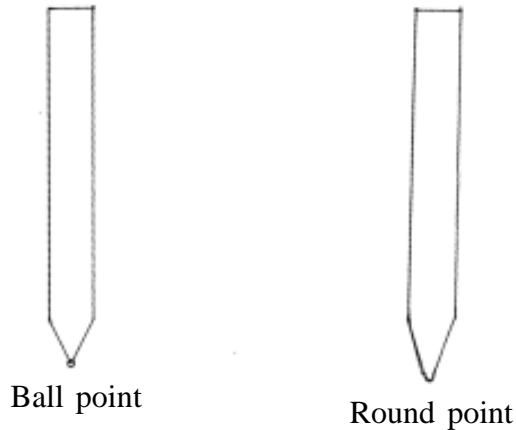
Blade :

Short groove : It assists in forming the loop in the needle thread.

Scarf :

3.6.3 Types of Needle of a sewing machine

Round point for woven garments, Ball point for light weight and knitted garments as shown in **Fig. No. 3**.



Sewing machine needles

Fig. No. 3

3.6.4 Size of a sewing needle/needle numbers

Sewing needles are classified according to numbers. The higher number specified coarser needle. The needle number ranges 4 to 28.

Numbering System : Higher the number thicker the needle.

DB × 1 for lock stitch m/c.

DP × 5 for Button hole m/c.

TQ × 1 for Button Stitch m/c.

TV × 1 for feed off the arm.

3.6.5 Sewing Defects

Defects that may occur during stitching/sewing are listed below :

- (i) **Feed damage :** This type of defect which mainly occurs in thick and sheer fabric.

- (ii) **Ruptured thread** : This is caused due to bad quality and wrong size of needle.
- (iii) **Skipped stitches** : The stitch line deviates from the original position due to irregular pick up by the hook of the thread loop from the needle eye.
- (iv) **Thread breaks** : This type of faults may occur at the time of stitching due to following reasons :
 - (a) If the upper thread being incorrectly set.
 - (b) If the upper thread and bobbin thread tension is too tight.
 - (c) Bad quality of thread and if the thread count not taken as per quality/ type of material being sewn.
 - (d) Needle being bent blunt or incorrectly set.
 - (e) Accumulation of fluffs, dirty in and around the shuttle or bobbin space.
- (v) **Staggered stitches** : The effect of faulty feed motion and the wrong needle or machine parts. It also arises due to bad tension in threading.
- (vi) **Seam pucker** : This type of defects arise at the time of stitching due to improper feeding caused by the displacement between top and bottom fabric plies, fabric structure and thread tensions.

In case of coarse fabric the fabric structure becoming jammed due to introduction of sewing needle and thread.

In practical field, we noticed that puckering can be caused due to excessive sewing thread tension. Again we see this problem in case of synthetic yarns more than cotton yarns. So, in case of both needle and under thread tension should be set as low as possible and proper quality of thread should be choosed.

- (vii) **Fabric damage** : Fabric damage is the type of sewing faults can be caused by the needles of inappropriate size or needle with worn or bent point.

A fabric which is difficult to feed or which is subjected to high pressure at the time of feeding can damage during sewing.

In high speed sewing machine the heat generated by friction at the needle can be enough to melt a synthetic yarn.

3.7 Sewing Threads

Sewing threads are generally used for stitching purposes.

A thread is the common term used in the textile industry is a special type of yarn usually finer, smooth appearance, stronger and adequate extensibility than what is usually considered a yarn.

So, sewing thread is a type of single, folded or cabled yarn made of natural, manmade fibre or synthetic filament or spun yarns. Sewing thread comes in different sizes from 20 to 100 size, larger the number, the finer is the thread.

The selection of thread depends upon the type of fabric being used, finer fabric require fine thread.

Again thread selection also based on colour of the fabric as light or deep shade.

Soft cotton thread of different colours are generally used in domestic and in garment industry.

Cotton sewing threads are available in soft, mercerized and glazed form.

Soft cotton thread is usually of 3 ply construction. Again mercerized cotton thread of 3 ply construction is stronger than soft cotton thread of 3 ply construction due to mercerization.

Glazed or polished cotton thread has a polished surface and 6 ply thread is much strong usually used for sewing buttons.

Again synthetic sewing thread is of two types, staple spun yarn and filament yarn. Staple spun yarn is either pure yarn, blended yarn like cotton and polyester core spun yarn.

3.7.1 Essential characteristics of Sewing thread

(a) The sewing thread should be strong and it should have sufficient breaking strength as stitch quality must be good to satisfy the consumers desire for performance and aesthetics.

(b) It should be capable of withstanding the shock of loading.

(c) It should be have abrasion resistance and resistance to higher temperature.

(d) The sewing thread should be soft, polished, smooth and faults fall like knots, neps and hairness.

(e) Thread should have sufficient extensibility and low thermal shrinkage.

(f) Sewing thread should be uniformly dyed and colour fastness.

(g) Sewing thread should have balanced structure i.e. balanced twist. To keep balanced twist thread is given opposite twist in plying.

■ **Hem** : Hem is the finished bottom surface edge of a garment.

The fabric edge is turned up 1/4" and doubled then finished through hem sewn by hand or machine.

Hem stitch should be even in width all around the garment and must be smooth and flat.

Today, in apparel house Hem stitch sewn through hemming machine. Hem is of various types like (i) Narrow hem, (ii) Broad hem, (iii) Rolled hem, (iv) Blind hem/ False hem and (v) Fegotting hem.

■ **Smocking** : Smocking is the decorative addition and an art work made through embroidery stitches over the folds of gather.



Fig. No. 4

Smocking is the stitching effect that makes the work elastic and controls the fullness. It is specially preferred for childrens clothing and also for the surface interest and new look of style to bodywear.

The effect is shown in the **Fig. No. 4**.

3.8 Button Stitching Machine

Through this type of machine 49 different types of button can be stitched.

Two types of machine is available. (a) Chain stitch button stitching machine, (b) Lock stitch button stitching machine.

3.8.1 Button hole stitching and cutting machine

A fully automatic button hole stitching and cutting machine can produce 1800 pcs shirts/8 Hrs.

Manually operated machine can produce 450 shirts/8 Hrs.

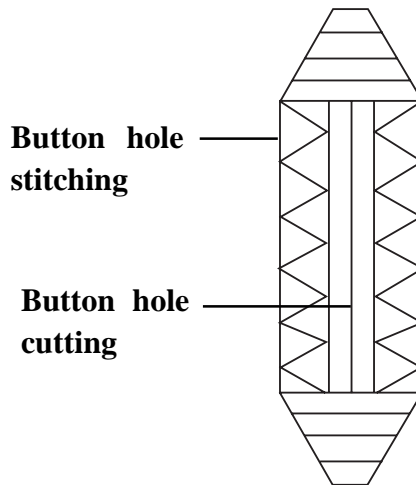


Fig. 5

3.8.2 Reason for Irregular/improper stitching

- (a) Blunt or bent needle/needle point.
- (b) Upright thread and bobbin thread tension being too tight or too loose.
- (c) Accumulation of fluffs in tension disc, throat plate and in the bobble case.
- (d) Using too strong thread for stitching finer materials.
- (e) If the machine is not regularly cleaned.

3.8.3 For better / Proper stitching

- (a) Same count of thread to be used in bobbin and in spool pin.
- (b) Sewing machine will run better if it is regularly cleaned/oiling schedule maintained accordingly.

- (c) Thread count should be used as per type of fabric.
- (d) Degree of thread tension should be perfect in case of bobbin and upright thread.
- (e) Quality of needle should be good and needle number choosed as per count of cloth.

3.9 Self Assessment Questions

Q. How fabric damage can be prevented?

Fabric damage can be prevented by the following measures

- = Using proper size needle without defect.
- = Good fabric quality with fabric finishing.
- = Cooling arrangement in the sewing room.
- = Proper checking of the sewing machine before use.

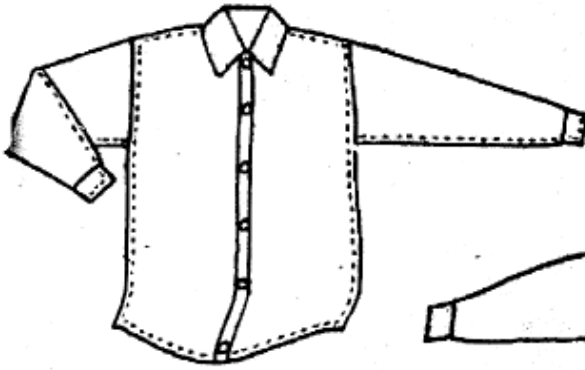
Q. Needle breaks frequently why?

This type of problem many arise due to reasons as follows :

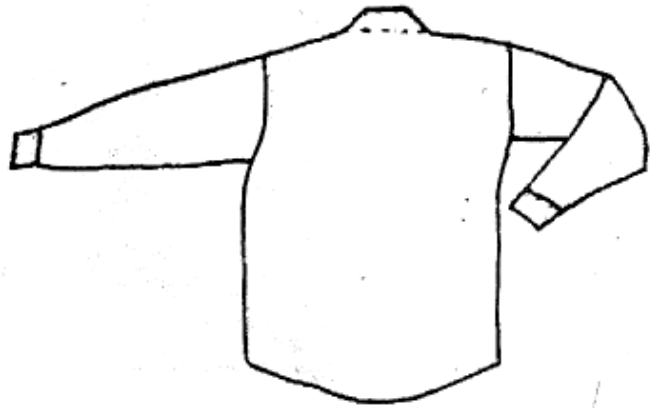
- = Improper thread count.
- = Bad needle quality
- = Bent needle and is caught by the looper
- = Needle deflect into the throuat plate due to wrong handing at the time of sewing.

3.10 Assessment

1. How fabric damage can be prevented?
2. Needle breaks frequently why?
3. Why we do wear clothes?
4. What is the purpose of them stitch?
5. What is smocking?
6. Construction of a trouser Fig. 6(ii).
7. Construction of a full sleeve shirt Fig. 6(i).
8. View of different stitches Fig. 7.
9. View of Indian and Western ladies top Fig. 8.
10. View of a shoulder princess line top and box pleated skirt Fig. 9.
11. View of Gathers and Frills Fig. 10.

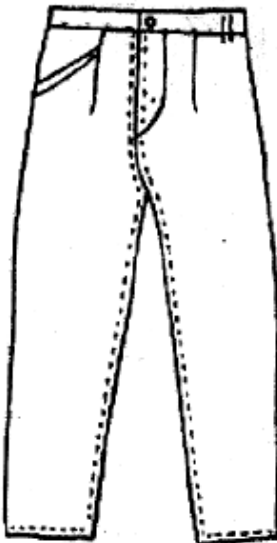


Front View



Back View

Fig. No. 6(i)



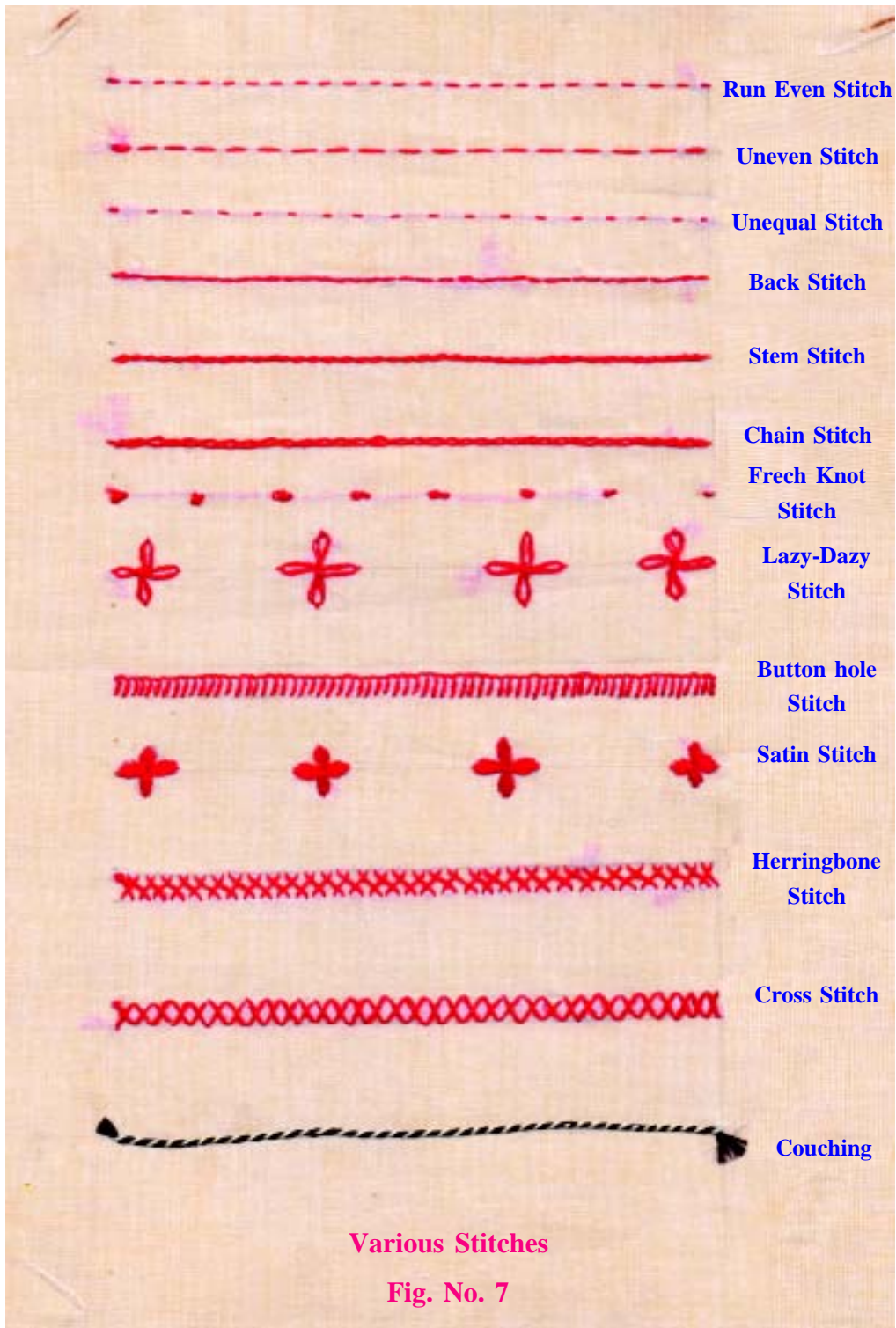
Front View



Back View

Construction of Man's Shirt and Trouser

Fig. No. 6(ii)





**A Shoulder Princess Line
Top and Skirt (Box Pleated)**

Fig. No. 9



Indian Ladies Top

Fig. No. 8 (i)



Western Ladies Top

Fig. No. 8 (ii)



View of Gathers and Frills
Fig. No. 10