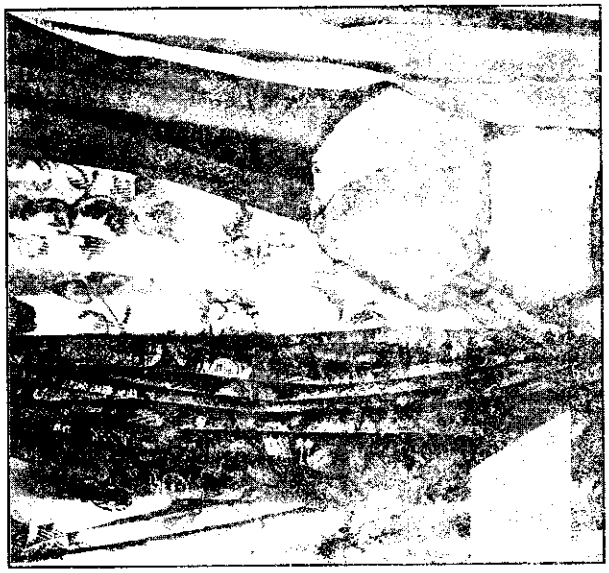
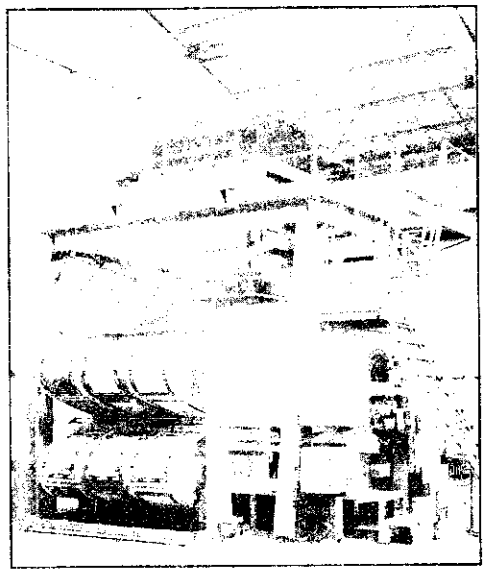




SPECIAL FABRIC PRODUCTION

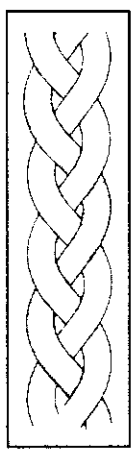
BRAID FABRICS

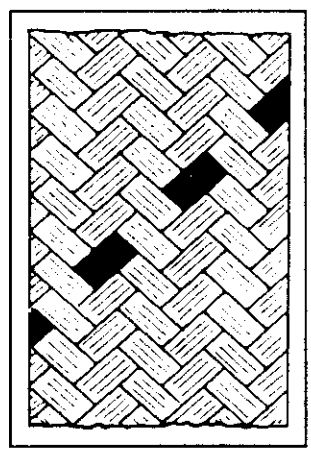
Main features of Braid Fabrics:

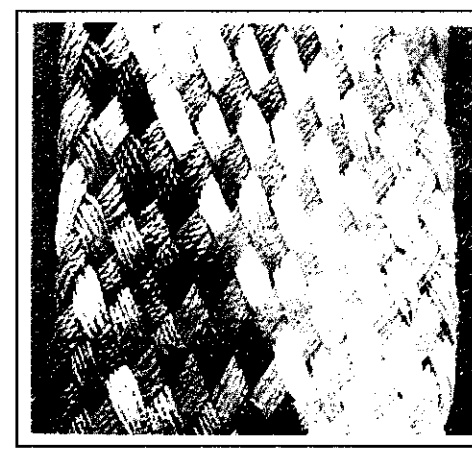
Braiding is a simple form of narrow fabric construction. Strands are plaited together by criss-crossing them diagonally and lengthwise. A familiar illustration of the method is that of braiding long hair. Braid for fabric use is formed on a braiding machine by interlacing three or more strands of yarn so that each strand passes over and under one or more of the others. They have good elongation characteristics and are very pliable, curving around edges nicely.

The main characteristics of braid include the followings:

- Yarns are interlaced both diagonally and lengthwise.
- Braid is stretchy and easily shaped.
- Flat or three-dimensional braid is used for trim and industrial products.







Types of Braid:

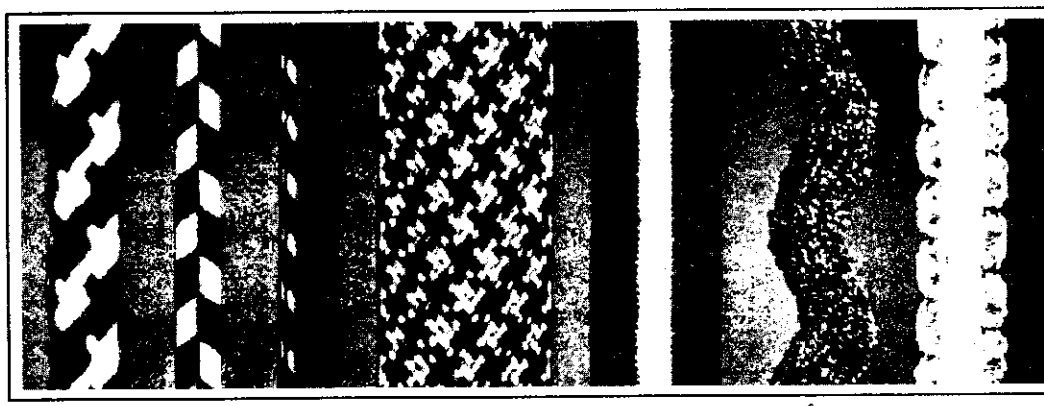
Braids are divided into two types:

1) Flat braids, in the form of strips or narrow flat tapes; and
2) Round braids, tubular in form, which may be hollow or have a center core of some material.

Both types of braiding are produced from any of the textile fibres, as well as from metal threads, tinsel, straw, wire, or leather.

The following figures show the examples of some fancy braids:

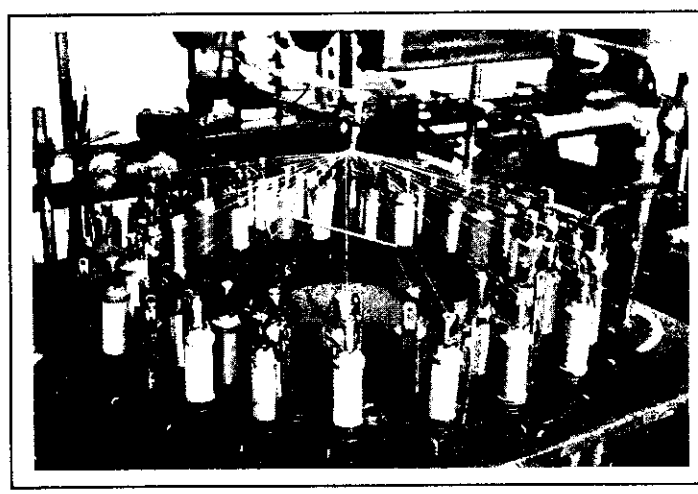
a) Patterned round braid
b) Patterned soutache braid
c) Corded edge braid
d) Patterned flat braid
e) Patterned flat braid
f) Ricrac braid
g) Frill braid



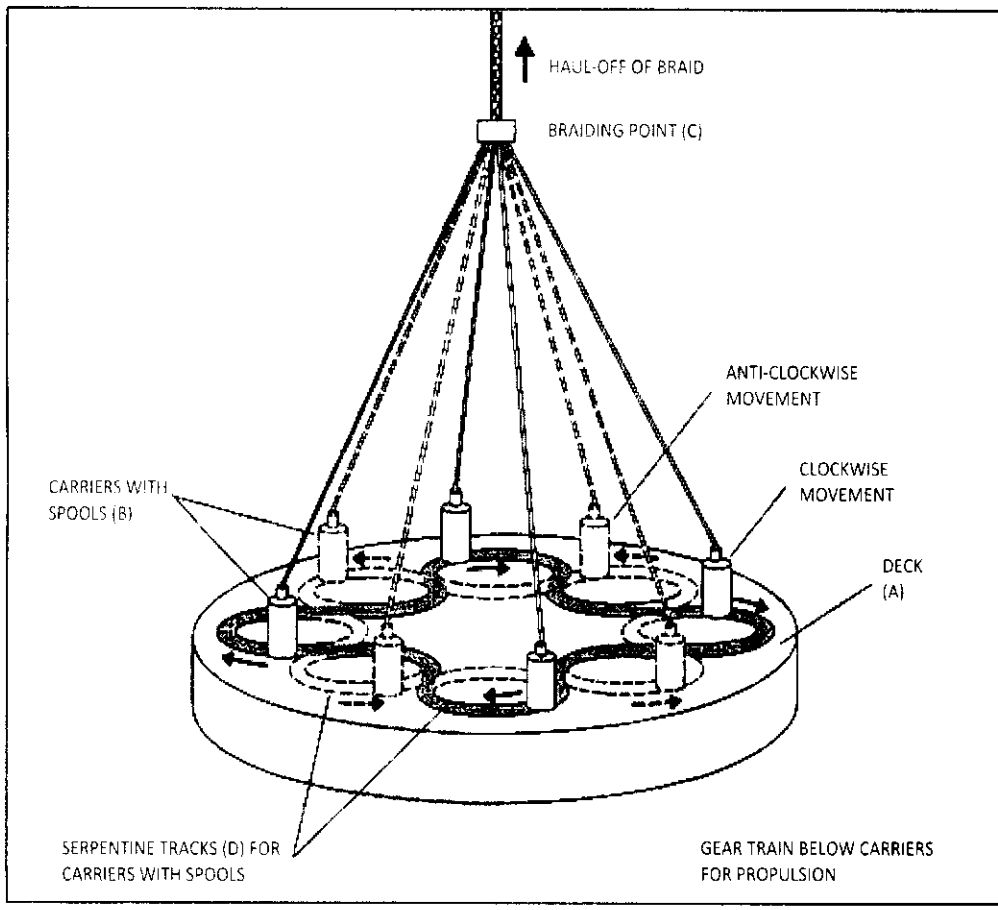
a b c d e f g

Manufacturing Principle:

The traditional circular braiding machine contains a series of bobbins of yarn mounted on a moving track at the bottom of the machine. The braid is produced as the bobbins move in and out around the base of the machine, much as Maypole dancers do. Interweaving yarns by braiding produces a flexible fabric; the fabric can be stretched in one direction, but it contracts in the other.



Braiding machine



Schematic if the basic principle of the maypole (round) braider

End Uses:

This principle of fabric construction is used for making shaped articles, such as straw hats and small rugs; narrow fabrics, such as ribbons and braids for millinery and accessory dress materials; cords and tapes, such as fish lines, shoe laces, wicks, parachute and glider cords, and elastic of various types; and cord coverings for tires, tubing, hose, wires, and cables.

Circular braids appear in such everyday items as shoe laces and insulation for electric wires, but braiding techniques are also used to produce rocket nozzles, parachute cords, and structural components for other industrial products.

Flat braids are used for such products as decorative trims and industrial belting, where a high degree of flexibility is required.

MULTI COMPONENT FABRICS

A multi component fabric is one in which at least two layers of material or fabric have been combined to produce a new product with properties significantly different from those of its component parts. The components may be intimately joined to produce a material from which it is difficult to separate them, or it may be a loosely joined material in which the components retain their original forms. The major multi component fabrics are bonded fabrics, laminated fabrics, foam-backed fabrics, and quilted fabrics.

A. Bonded Fabrics

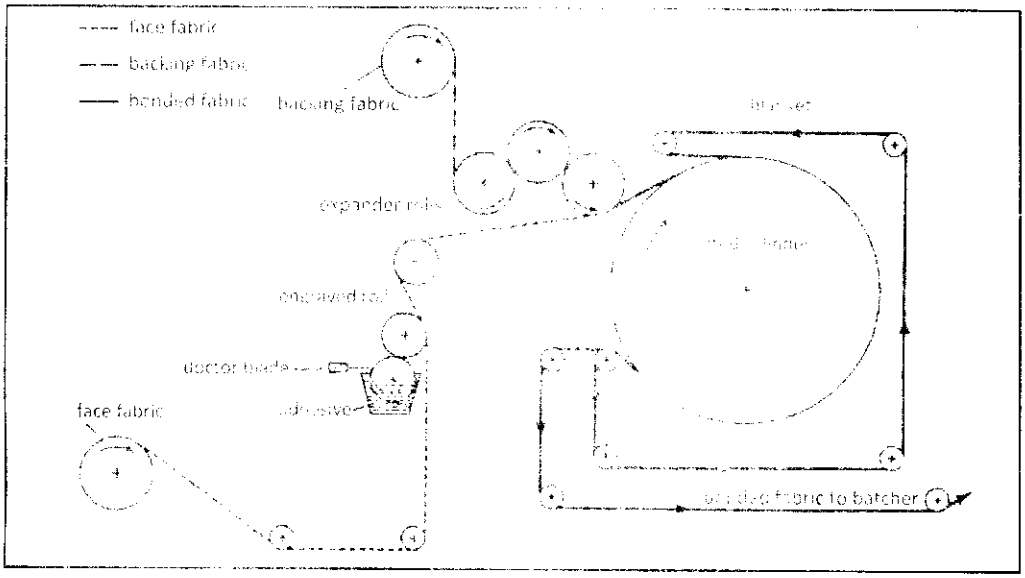
A bonded fabric is a layered structure in which a face, or shell, fabric is joined to a backing fabric with an adhesive that does not significantly add to the thickness of the combined fabrics. Such structures are used for design interest as well as fabric stabilization. Some of the artificial leather products could be classified as bonded fabrics.

The bonding may be done with an aqueous acrylic adhesive, a latex adhesive such as an acrylate, a vinyl chloride or vinyl acetate, or a thermosetting resin. The end use performance of the bonded product depends on the strength of the bond formed between the two fabric layers. A fabric resembling woven double cloth can be produced by joining two face fabrics to provide a reversible fabric. In some instances, a lining fabric is bonded to a face fabric to simplify garment construction. Scrim fabrics such as tricot knits and gauze are also bonded to face fabrics to provide stability to the face fabric. This process has been used on loosely woven mohair fabrics and on fabrics constructed from bulky novelty yarns, to prevent yarn slippage and fabric distortion.

Fabric to fabric bonding:

When two layers of fabric are joined, the purpose is to provide greater stability and body to the face fabric or to create a self-lined fabric. The under layer in bonded fabrics is often knitted tricot or jersey, used because they have good flexibility, are relatively inexpensive, and slide readily, making them easy to don over other garments. For the most part, fabrics used in bonding are less expensive and lower-quality fabrics that can be upgraded by this process.

Two methods can be used for attaching fabric to fabric. The wet-adhesive method places an adhesive material on the back of the face fabric, and together the fabrics are passed between heated rollers that activate and set the adhesive.



Fabric-to-fabric bonding process

The second method is known as the flame-foam method. A thin layer of polyurethane foam is melted slightly by passing it over a flame. The two layers of fabric are sandwiched around the foam, which then dries, forming the bond between the two layers of fabric. Ideally, the layer of foam should be so thin that it virtually disappears. (The foam in the finished fabric is about 0.010 inch thick.) The foam does, however, add body to the fabric and produces a somewhat stiffer fabric than does the wet-adhesive method. It is preferable that the flame-foam method not be used with open-weave fabrics because of the possibility that some of the foam may appear on the surface of the fabric.

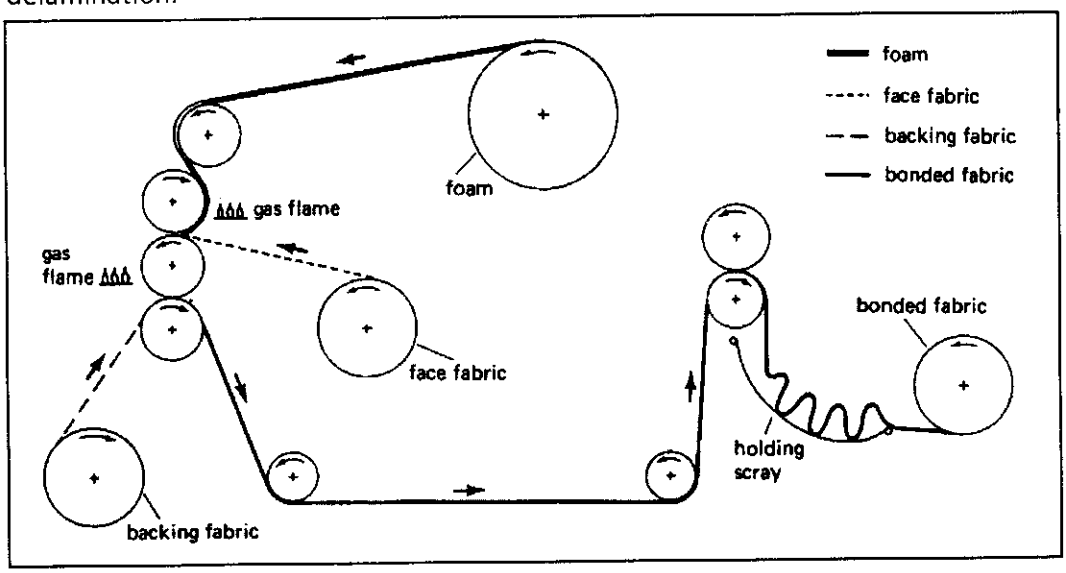
B. Laminated Fabrics

Laminated fabrics combine layers of fabric and foam. The product may be a single layer of fabric bonded to a foam layer (a foam-backed fabric), or it may be a sandwich laminate, in which the foam layer is bonded between two fabric layers. The primary purpose of the foam layer is to provide insulation for warmth, and the end uses for such products include cold-weather apparel and insulated window coverings. The completed fabric is often bulky, with poor draping qualities.

The foam may also serve as the adhesive agent. The surface of the foam is heated to provide a tacky surface that will adhere to the face fabric(s), and then the layers are pressed together and allowed to cool and cure. Adhesive similar to those used in fabric-to-fabric bonding are also used. Again the end-use performance of the laminate depends on the strength of the fabric-to-foam bond.

A major consumer complaint about bonded and laminated fabrics has been that they delaminate during washing and dry cleaning. Some of the adhesives used are sensitive to water, and others are affected by dry-cleaning solvents; some thermosetting resins

are affected by high temperatures. Read and follow care label instructions to prevent delamination.



Fabric-to-foam-to-fabric bonding process

C. Quilted Fabrics

Quilted fabrics are layered materials consisting of two cloths that encase a filling and are stitched together to form a puffy unit.

Composition of Quilted Fabrics:

The outer layers of quilted fabrics used for apparel are generally of cotton, polyester, nylon, or blends of such fibres. For insulative purposes and to prevent any filling from working through the outer material, the cloth should be closely woven.

A new concept in mattress and box spring covers, Bedsack adds an upholstered look to the bed. The cotton-polyester blended cover fabrics are ultra-sonically quilted and filled with kodel polyester.

The filling may be goose down; a down and feathers mixture; kapok; polyester staple or continuous filament; resin-bonded polyester; acrylic staple fibre; or polyester or polypropylene microfiber. Quilted fabric should be comprised of about 90 percent air and 10 percent fibre. In terms of weight or mass in relation to warmth, down is more effective than acrylic and polyester fibres. When hollow manmade fibres are used, there is a slightly greater insulation than offered by the solid fibres of the same type. The microfibers, which may be as much as ten times finer than the staple fibres with about twenty times more surface area per unit of weight, have a much greater ability to trap air and have been shown to provide still greater insulation. For example, Thinsulate, a batting of either polyester fibre and polypropylene microfiber or of all polypropylene microfiber, is claimed by its manufacturer, the BM Company, to provide 1.8 times as much insulation as a comparable thickness of down.

Characteristics of Quilted Fabrics:

All other factors being equal, a fabric with fewer quilt lines will provide greater insulation because there is little insulation at the lines. Furthermore, the insulation itself tends to move away from the quilt lines thus reducing the areas of insulation.

It is important to note that when a quilted fabric gets wet and moisture penetrates into the filling, its insulative property is markedly reduced – as is true for fabrics generally. However, it has been demonstrated that a filling of polyester and polypropylene fibres, particularly microfibers, recovers more fully from compression when wet than other fillings and therefore provides greater volume faster with the consequent insulation. Water-repellent finishes on the outer cloth does help maintain dryness, but heavy rain or other sources of water saturation will eventually penetrate fabric pores and stitching holes. Water proofing will overcome this problem, but that prevents the natural vapour flow of humidity and body perspiration to escape and will ultimately cause discomfort.

Good quilted fabrics for outdoor use should be wind-resistant for greater protection. Wind resistance is achieved by weaving fine yarns very compactly so as to reduce to a minimum the size of the interstices, or pores, of the fabrics. Such fabrics are very frequently made of polyester / cotton blended yarns, but more effective are those made of all- cotton. When given a water-repellent finish, all-cotton fabric can be even more effective against rain and snow than a polyester / cotton fabric. Also effective is an all nylon polyester fabric with ciré finish which flattens the yarns and closes up the interstices. Weather conditions and personal considerations should affect the consumer's choice.

Different types of Quilted Fabrics:

Traditional Quilting:

Two or more fabric layers may be joined by stitching to produce a quilted fabric. The term stitching should be broadly defined to include the intermittent joining of fabrics by

hand or machine sewing, chemical point bonding, and ultrasonic point bonding. Fabrics quilted with both simple and more complex patterns are available.

Machine-stitched quilting

The traditional quilts stitched by hand had three layers: a face fabric, a fibre batt or feather filling for warmth, and a backing fabric. Hand-sewn quilts are still produced as craft items, and machine-sewn products are also available. Such products are used primarily for bed coverings, but quilted apparel, upholstery fabric, and items such as pot-holders are available as well.

Trapunto:

Trapunto is a type of quilting in which a design or pattern is outlined with stitches and then stuffed with fibres (or fiberfill) to form a high relief effect. Such designs are periodically fashionable in apparel and upholstery.

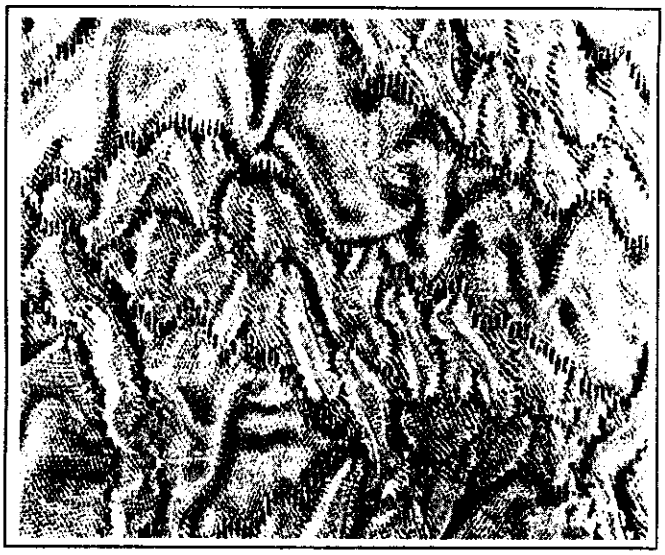
Outline Quilting:

Outline quilting is a technique that stitches an outline around a printed design motif to form a quilted fabric. Custom bedspreads and comforters of chintz or other printed fabrics often are made in this manner. Outline quilting is also called custom quilting.

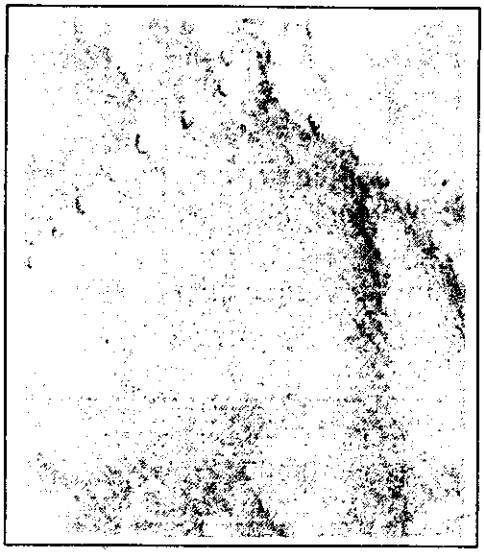
Chemical Quilting:

Quilted products can also be produced by joining fabric layers with an adhesive or a thermoplastic bonding agent. This process, called chemical quilting, is more popular for joining two fabrics than for joining three layers. The trade name chemstitch is used for a process that produces a fabric by joining two fabrics with different thermal stabilities.

The two layers are spot welded to produce a design, then subjected to heat, which shrinks one layer more than the other and produces a fabric with a rippled or crinkled surface.



Chemstitching quilting



Ultrasonic bonded quilting

Ultrasonic Bonded Quilting:

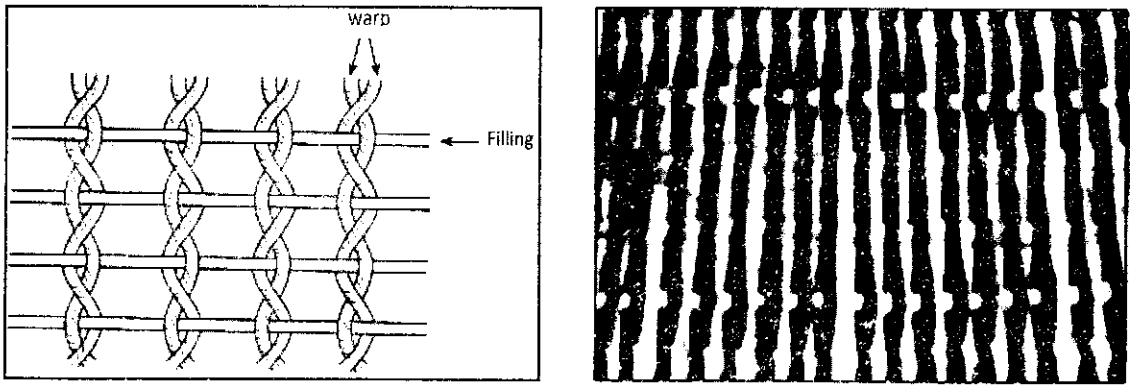
Ultrasonic energy can be used to join thermoplastic materials and produce a product similar in appearance to machine-stitched quilting. The trade name Pinsonic is used for one such process. Ultrasonic energy is mechanical vibratory energy produced at frequencies beyond the level of audible sound, usually 20 to 40 kHz. The vibration produces enough intermolecular mechanical stress to cause polymer melting and provide a tacky surface that can adhere to another surface. The two layers are pressed together in a pattern that can be made to resemble real stitches. Ultrasonic bonding can be accomplished at high speeds and is less damaging to fibres than thermal bonding.

Mattress pads and bedspreads are frequently produced by ultrasonic quilting. Other applications include upholstery fabrics, quilted apparel fabrics, and nonwoven fabric webs for some industrial markets.

LENO OR GAUZE FABRICS

Features of the Leno or Gauze Fabric:

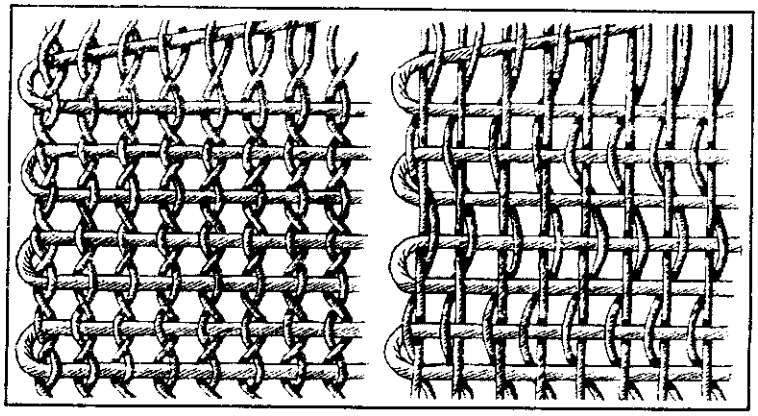
Leno or gauze is a weave in which the warp yarns do not lie parallel to each other. Warp yarns work in groups, usually pairs of two; one yarn of each pair is crossed over the other before the filling yarn is inserted. When looking at a leno fabric, one might think that the yarns were twisted fully around each other, but this is not true. Careful examination shows that they are crossed and that one yarn of the pair is always above the other.



Leno weave: Diagram (Left) and Fabric (Right)

The gauze weave must not be confused with the weave used in manufacturing gauze bandages or cheese cloth; these materials are made with the plain weave. The true gauze weave construction produces a fabric very light in weight and with an open-mesh effect. Curtain materials and some shirting and dress goods are woven with this weave. Such light-weight fabrics have a strength that could not be provided by the plain weave. In the gauze weave, strength is gained by the manner in which the yarns are inter-twisted: each weft yarn is encircled by two warp yarns twisted about each other. The gauze weave is sometimes referred to as the leno weave because it is made on a leno loom, but the true leno weave is a variation of the gauze weave.

On the leno loom, the action of one warp yarn is similar to the action of the warp in the plain weave. The doup attachment, a hairpin-like device at the heddle, alternately pulls the second warp yarn up or down to the right or left with each pick passage. This causes the pair of warps to be twisted, in effect, around each weft yarn.



Gauge weave (left) and Leno weave (right)

The leno is sometimes used in combination with the plain weave to produce a stripe or figure on a plain back ground. Generally, the term 'leno' is used synonymously with 'gauze'. Fabrics made with the gauze weave are manifestly sheer. Yet, their weights vary depending upon the thickness of the yarns, which could be of spun, filament, or combinations of these yarns.

Weaving Principle:

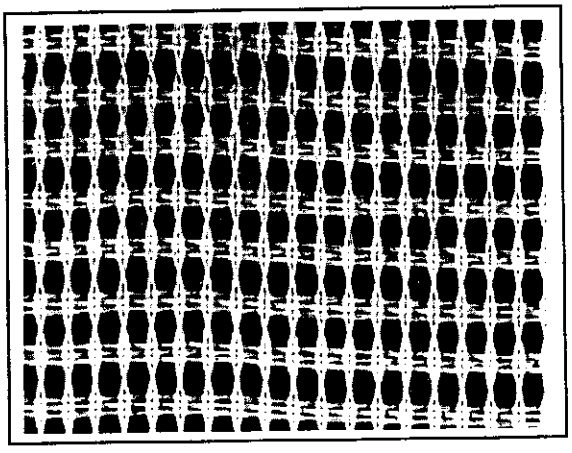
Leno is made with a doup attachment, (It is the device used on looms to create the leno weave, in which warp yarns cross over each other to create an open, stable woven structure.) which may be used with a plain or a dobby loom. The attachment consists of a thin needle supported by two heddles. One yarn of each pair is threaded through an eye at the upper end of the needle, and the other yarn is drawn between the two heddles. Both yarns are threaded through the same dent in the reed. During weaving, when one of the two heddles is raised, the yarn that is threaded through the needle is drawn across to the left. When the other heddle is raised, the same yarn is drawn across to the right.

End Uses:

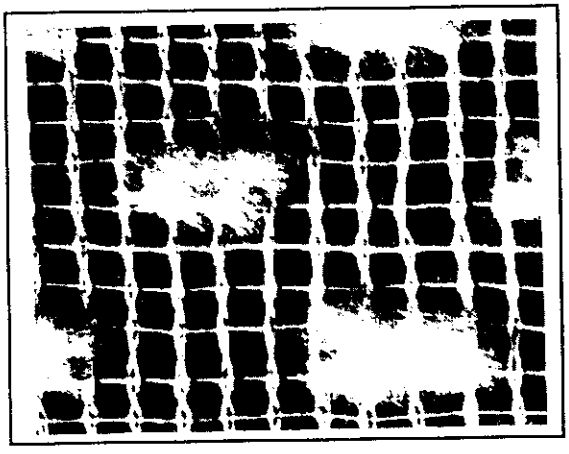
Fabrics made by leno weave include marquisette (It is a sheer, light weight, leno weave fabric, usually made of filament yarns), mosquito netting, agritextiles to shade delicate plants, and some bags for laundry, fruit, and vegetables.

Polyester marquisettes are widely used for sheer curtains. Casement draperies (Casement cloth is a general term for any open-weave fabric used for drapery or curtain fabrics. It is usually sheer.) are frequently made with leno-weave and novelty yarns. Thermal blankets are sometimes made of leno weave. All these fabrics are characterized by sheerness or open spaces between the yarns. The crossed-yarn arrangement gives

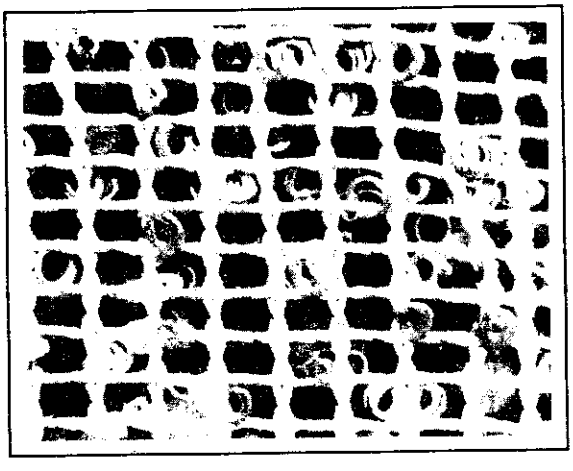
greater firmness and strength than plain-weave fabrics for a similar low count and minimizes yarn slippage. Snagging may be a problem in used and care, however.



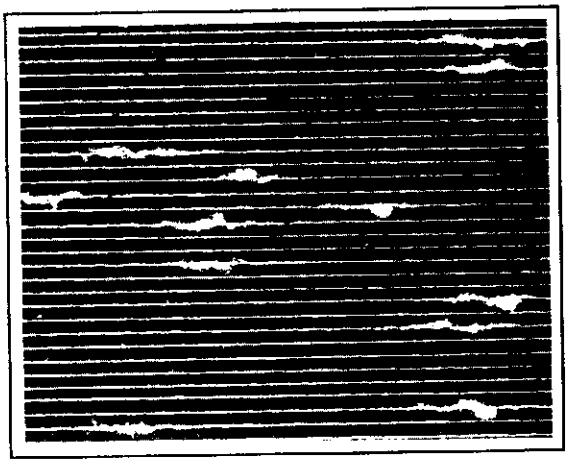
Marquisette



Figured Marquisette



Leno fabric with bouclé yarns

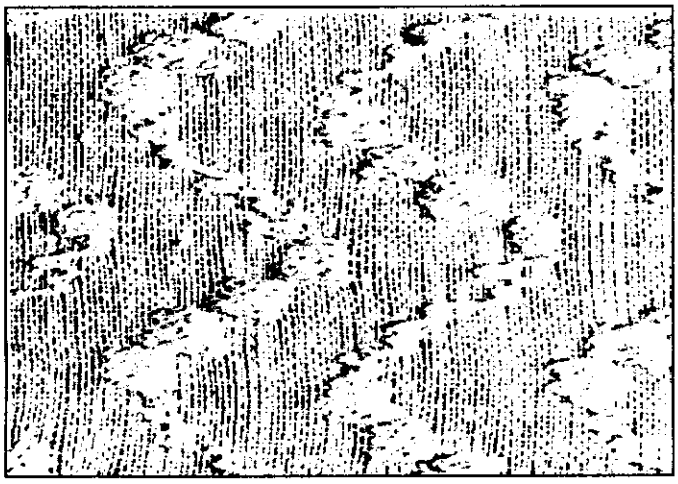


Fabric of acetate random slub yarns

LAPPET AND SWIVEL FABRICS

Features of Lappet Weave:

Lappet weaving is a kind of embroidery, in which various effects and patterns are produced along with the ground fabric. The figures are produced by giving horizontal motion to a thick end, simultaneously upon a fine muslin or gauze ground. Only small solid loose spot figures can be woven and the floats cannot be bound in the middle. However, extensive figure effects may be produced by skilful designing and by the use of several lappet frames.



Lappet (right side)

The lappet weave is used to super impose a small design on the surface of a fabric while it is being woven. In the lappet weave, the design is stitched into the fabric by needles that operate at right angles to the construction. Thus, the lappet weave is very similar to embroidery. This weave is employed on a variety of fabrics where novelty patterns are desired.

Lappet Weaving Principle:

Lappet patterns contain extra warp yarns woven into a base fabric by means of a frame, or rack, fastened to the loom near the reed (set in front of the reed). Long needles are carried in the frame, and the yarns to be used in making the design are threaded through the needles. When the rack is lowered, the needles are pressed to the bottom of the shed and held in position while a pick is laid. The rack is then raised, and the pick is beaten into the cloth. Next the rack is shifted sideways to a new location, and the same action is repeated.

Each time the frame or rack moves sideways, it carries the yarn in the needle across the surface of the fabric and creates a row of the pattern. If long floats are formed on the back of the fabric, they may be trimmed; if they are short, they are usually left alone. This presents both an advantage and a disadvantage. If the floats remain, the pattern is durable, but the floats can easily be snagged, causing damage to the fabric. If the floats are cut, the design area is weakened and may be gradually removed during use and care. The lappet weave is considered strong and durable, but it is comparatively expensive. Currently, no lappet fabrics are produced in the United states, but some are still produced in Europe.

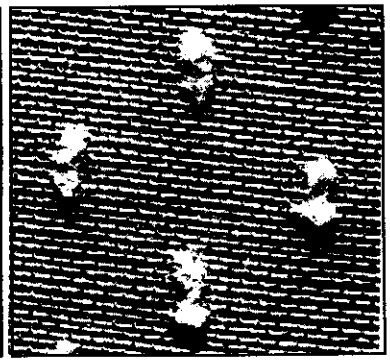
Features of Swivel Weave:

The swivel weave is the method by which decorative effects, such as dots, circles, or other figures, are interwoven on the surface of a fabric while it is being constructed on the loom. The weaving of the design requires an extra filling yarn and additional small shuttles or insertion devices. A separate shed is made for them. While the fabric is being constructed, the row of small shuttles drops across the width of the loom, and each interweaves its separate design with a circular motion on a small area of the warp.

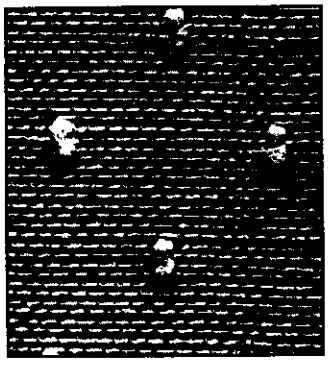
The swivel process permits the weaving of different colours in the same row because each figure has its own shuttle; however, each column consists of repeats of the same colour. In fabrics with small designs, the swivel can produce prominent, raised figures with very little additional yarn. The pattern yarn is fastened securely as each figure is completed, and it cannot pull out without severely damaging the fabric.

Swivel weaves can be distinguished by the appearance of an identical pattern on both the face and the back of the fabric. The decoration produced by the swivel weave is not considered durable, because the swivel yarns are cut when the fabric is completed and cannot be securely fastened. The cut ends roughen the under surface of the fabric and may pull out if it is handled roughly, as may happen in laundering.

Swivel (wrong side)



Swivel (wrong side)



Swivel (face side)

The swivel weaves is employed with sheer light-weights, such as dotted swiss (generally a voile or lawn construction woven with either clip spots or swivel dots. The clip spot is the more popular version. The fabric is given a crisp, clear finish, which may be permanent or semi permanent. Often yarn dyed dots are woven on a white ground, or a dark ground has white dots. Many imitations on the market e.g. pigment and flock dots.) and grenadine (Fine, loosely woven leno fabric similar to marquisette. May be made on Jacquard loom. Used for curtains, blouses, dresses.) and medium-weights, such as madras (Cotton fabric of plain weave of coarse yarns. Usually comes in stripes, checks, or plaids. Colours may bleed. Used for shirtings.).

Swivel Weaving Principle:

Swivel designs are produced by winding extra weft yarns on small quills in special shuttles. These shuttles are strategically located at the points where the design is to occur. The pattern mechanism produces a shed, and the shuttle carries the yarn through the shed the distance of the pattern; in some cases, only a few warp yarns are interwoven to form the design. The process is repeated for each row of the design pattern. Between repeats of the pattern, the extra weft yarn floats on the back of the fabric; it is trimmed after weaving is completed.

Differences between Lappet and Swivel Design:

The essential difference between a lappet design and a swivel is that in the swivel the design is done with extra weft yarns, which are cut-off short at the end of each design. The lappet pattern appears only on the right side of the fabric, since the floats forming the pattern are fastened to the ground fabric only at their extremities. Lappet designs are made of one continuous yarn and are not clipped.

Lappet, swivel and clipped spot are all woven fabrics; none is embroidered, although the effect is that of machine embroidery.

DENIM FABRICS

Main Features of Denim Fabrics:

Typical denim fabrics are woven from coarse, indigo-dyed cotton yarn. They are hard-wearing, high density fabrics with a high mass per unit area. Today, more denim is produced in the world than any other type of cloth. Denim fabrics are made for a variety of applications and in a wide range of qualities and shades. Even today, classic denim is still dyed with indigo. It is a special process in which only the surface of the warp yarn is dyed; the core stays white. This is why the garment subsequently develops the typical – and desired – signs of wear.

It is a cotton or cotton / polyester blend, durable heavy weight twill weave, yarn-dyed fabric. Usually the warp is coloured and the weft is white. It is often a left-hand twill with a blue (indigo) warp and white weft for use in apparel in a variety of weights. Since it is a warp-faced twill, the coloured warp yarns predominate on the face and the white weft yarns on the back. It is available in several weights, ranging from 203.46 gm/m^2 (6 oz/yd^2) to 474.74 gm/m^2 (14 oz/yd^2) or more in a $\frac{2}{1}$ or, $\frac{3}{1}$ interlacing pattern. Its long term popularity has made it a fashion fabric in casual wear. It may be napped, printed, made with spandex or other stretch yarns, or otherwise modified for fashion.

$$\text{Fabric construction: } \frac{(7\text{'s X } 8\text{'s to } 16\text{'s x } 23\text{'s})}{(60 \text{ X } 36 \text{ to } 72 \text{ x } 44)} \times \text{ Fabric width.}$$

Raw materials of Denim Fabric:

To produce good quality denim, the conditions have to be optimal regarding the quality of all the raw materials and yarn used. For raw cotton and the carded OE (rotor) or ring spun yarns made from it, the quality criteria are as follows:

- Minimum staple length: 2.7 cm
- Proportion of short fibres (less than 12 mm long): under 40%
- Micronaire value: 4.0 to 4.5
- The Uster values for strength and elongation, the evenness CV and imperfections must conform at least to the 25% plot
- The usual count range of denim warp yarns is 50 to 90 tex and of weft yarns is 75 to 120 tex; finer yarns as fine as 25 tex in twill or plain weave are often used in denim shirts
- Twist factor: 4.5 to 5.0 for warp yarns, 4.2 for weft yarns
- Low yarn hairiness
- Yarn strength and uniformity.

In the early 1990_s, most of the yarns used in denim production were OE yarns. Recently, there is a strong trend towards using more carded ring spun yarns in both warp and weft. They give the fabric a softer handle, fulfilling the requirements for "soft denims". The following table shows the acceptable values for ring spun and OE cotton yarns with a fineness of 84 tex (7 N_e) for successful denim production.

Properties	Ring-spun yarn	OE Rotor yarn
Strength (cN/tex)	17	13
Elongation (%)	8.5	8.5
Uniformity (CV%)	12	12.5
Thin places (per 1000 m)	1	1
Slubs (per 1000 m)	50	20
Neps (per 1000 m)	50	3

Types of Denim:

Demand for fashion variants of classic denim will continue to grow. The most popular variants are:

- Stone-washed and double stone-washed denims
- Chambrays
- Fancy multicolour denims
- Denim with metal-effect yarns
- Elastic denims
- Printed denims
- Jacquard-patterned denims
- Denims with fancy yarns

Lightweight chambrays are used for shirt and blouses. Heavy, classic denims are made up into trousers or coats. Besides classic indigo blue, the fabric is dyed in other fashion shades and colours, the most popular being black denim. The fabrics are graded in clearly defined classes by weight, e.g. light denim 10 to 12 oz/sq.yd. or below it, heavy denim 14 to 16 oz/sq.yd. At present time, the following denim fabrics with their specific commercial name are widely produced in the denim industry of Bangladesh.

a. Basic or regular denim $\frac{3}{1}$
b. Ring denim $\frac{2}{1}$, there are 7, 9, 12 count of yarn used
c. Slub denim only warp slub (one way slub) and weft slub (cross slub)
d. Cross hatch denim
e. Stretch denim weft yarn (elastomer)
f. Poly denim polyester used in weft.

Warp Preparation:

In denim production, warp preparation, dyeing and sizing are crucially important. Dyeing with indigo requires detailed knowledge of the physical and chemical processes involved. The various dyeing and sizing methods, and the corresponding recipes and concentrations, reaction and oxidation times not only influence the weaving process; they are also largely responsible for the appearance and quality of the denim.

Besides the classic indigo rope dyeing process, indigo sheet dyeing is also used. One variant of sheet dyeing is loop dyeing. Dyeing and sizing are either done separately, as in rope and double sheet dyeing, or the two processes are combined in a single operation, as in sheet dyeing and loop dyeing.

Indigo Rope Dyeing:

In warp preparation for rope dyeing, 350 – 400 warp yarns are assembled on the ball warper to form a rope 10,000 to 15,000 meters long. Between 12 and 36 ropes are drawn through the dyeing range side by side. After dyeing they are dried on a drum drier and deposited in cans. The ends are spread out on a rebeamer or long chain beamer (lcb), and the yarn sheet is wound onto warp beams. These beams then come to the sizing machine, where they are sized, dried and assembled in accordance with the total number of ends required to make up the weaving warp beam. This process ensures optimal dyeing of the indigo, but with the disadvantages that broken ends are more frequent and yarn tensions are not always compensated. Modern indigo dyeing ranges normally operate with six dye vats. Using state-of-the-art methods, the same dyeing quality can be achieved with just three vats, with a substantial reduction in the consumption of chemicals. The production rate of this system is normally 2 to 3 times higher than the sheet dyeing system.

Indigo sheet dyeing and double sheet dyeing:

In indigo sheet dyeing, warp beams are brought to the dyeing and sizing range instead of ropes. Dyeing, drying, sizing and after repeated drying, assembly of the warp is carried out in a single operation. In the case of double sheet dyeing, dyeing and sizing are done in two separate steps. As far as indigo dyeing is concerned neither process is always ideal, but both have the advantage that the number of broken ends is low and yarn tension can be extremely well controlled.

Indigo loop dyeing:

In the loop dyeing process, the yarn is dyed in a single bath instead of several. The desired depth of colour is attained by passing the yarn through the vat several times. Subsequently, as part of the same process, the yarn is sized. The advantages and disadvantages of loop dyeing are the same as with sheet dyeing.

Sizing recipes:

The sizing process plays a key role in further processing of the warps. The choice of sizing agents used to achieve the sizing effect is crucially important here. A relatively soft handle can be achieved using a combination of modified starch with a polyacrylate. Warps sized in this way have good running properties, helping to ensure high efficiency and an excellent final appearance. A practical example is given below:

Style data:
Warp: OE yarn, 84 tex (7 N_e), 24 ends/cm
Weft: OE yarn, 100 tex (6 N_e), 16 picks/cm
Total number of warp ends: 3942

Size recipe for 100 liters of liquor:
- 8.0 kg modified starch
- 4.0 kg acrylate size
- O.2 kg textile wax
- Size concentration: 8.0 %
- Size temperature: 85^{0}C
- Squeezing pressure: approx. 15 kN
- Size pick up: 9 – 10 %

Advantages of the denim size recipe:

Sizing room:
- Easy separation of ends
- No hard size
- Only slight bleeding
- No colour masking
- Minimal dust and fibre fly.

Weaving room:
- High, constant weaving efficiency
- Easy warp take-up
- Minimal dust and fibre fly.

Weaving:

For finished widths of 150cm to 156cm, reed widths of 160cm to 167cm are required. Denims that are stretchable in the weft do not follow this rule. When weaving with projectile weaving machines, these fabrics are generally woven in two panels with weaving widths of 360 or 390 cm. in this way a high weft insertion rate of 1400 m/min is achieved at a machine speed of approximately 400 picks/min. For the production of heavy denims, leno selvedges are advisable. Lighter denims, weighing less than 13 oz/sq. yd, can be woven with tucked selvedges. The fabrics can be inspected with an electronically controlled cloth inspection machine.

The current demand on soft denims in the United States is to use lyocell yarns (e.g. Tencel) in the weft. For structured denims, structured yarns are used for the weft. Slub and knob effects are especially popular.

Diversification of Denim:

This fabric became popular at first among people of western countries and then gradually all over the world. But, consumers' need for new products is unlimited. So, to meet this essential demand, the fabric designers and manufacturers were obliged to produce different types of denim at present, hundreds of derivatives of denim are available. Also new types of denim products are being developed. The diversification of denim has gone so far that some denims are not even twill based. They are being produced on plain-based weave design.

Denim is comparatively heavy fabric composed of higher linear density yarn both in warp and weft. This fabric is not very soft in handle. Different fancy yarn – slub yarn, thick-thin yarns are used in the diversification of denim. Lycra (elastomeric fibre) yarn is also introduced in the diversified denim. Diversification is also done by the change of EPI, PPI and count. Yarn of different count may be used in consecutive insertion for diversification. For increasing the agreed level of denim throughout the world, diversification is the most important factor. Denim is very popular among the teenagers as well as older people.

Denim's popularity was also on the rise. It was stronger and more expensive than jean, and though the two fabrics were very similar in some ways, they did have one major differences: denim was made of one coloured thread and one white thread; jean was woven of two threads of the same colour.

Denim is no longer a cotton product. Denims come with either polyamide, lycra, polypropylene or with polyester and especial bonding with a 100% nylon net for a more active look. Two way stretch fabrics and special coatings or rubberized effects continue to be a strong trend.

End Uses or Prospects:

In modern world, the apparels made from denim have become very popular among wearing. Now days, baby wear, men's trouser, shirts, ladies wear are also made from denim fabric, and day by day, its acceptability is increasing among consumers. Denim goods are now being used among almost all type of people. Denim wear crosses the line of fashion boundary. In the past, it was used by workers as a safety wear. Now it is used for making decorative cap and ladies hand bag, school and college bag, and travel bag. So, range of denim apparels are widening day by day. So Denim is used for jacket, pant, shirt, denim wine bags, denim pencil case, denim apron, denim pillows, denim quilt etc.

WOVEN PILE FABRICS

Pile fabrics have been defined as "fabrics with cut or uncut loops which stand up densely on the surface". Pile fabrics may be created by weaving or through other construction techniques, such as tufting, knitting, or stitch through. To create the loops that appear on the surface of woven pile fabrics, the weaving process incorporates an extra set of yarns that form the pile. Construction of woven pile fabrics, therefore, represents a complex form of weaving in which there are at least three sets of yarns. Example of pile fabrics produced by the pile method include corduroy, fleece, frieze, fake fur, plush, poodle cloth, terry cloth, velvet, velveteen and velour.

Woven pile fabrics have an extra set of warp or weft yarns interlaced with the ground warp and weft in such a manner that loops or cut ends extend from the base fabric. The base fabric may be constructed of either a plain or a twill weave.

The pile weave is a fancy weave that also includes a plain or a twill construction. In contrast to the three basic weaves (plain, twill, satin) that produce a flat surface on a fabric, the pile weave introduces a decorative third dimension, creating an effect of depth. Its construction is especially desirable when softness, warmth, and absorbency are desired. Pile weave fabrics are also durable if the proper yarns and adequate compact construction are used.

Pile fabrics can be divided into fabrics with loop pile and cut pile. Woven carpets, velvet and terry fabrics are the best-known pile fabrics.

Types of Woven Pile Fabric:

Woven pile fabrics are divided into two categories depending on whether the extra set of yarns is in the warp direction or the weft direction. Pile fabrics are woven by one of several methods, depending on whether they are warp pile or weft pile fabrics. Warp pile fabrics have two sets of warp yarns and one set of weft yarns. Weft pile fabrics have two sets of weft yarns and one set of warp yarns.

A. Weft Pile Fabrics:

Weft pile fabrics are woven by the weft pile method. No special weaving machines are needed to weave weft pile fabrics. In this method there are two sets of weft yarns and one set of warp yarns. Although the ground may be of either twill or plain weave, a twill base is preferred for its durability. The extra set of weft yarns forms floats that are over

three or more-frequently five to seven warp yarns in length. The weave used can be a weft satin or a warp rib weave. After weaving is completed, the floating yarns are cut at the center of the float, and these ends are brushed up on the surface of the fabric to form the pile surface. Weft pile fabrics usually have a short pile; the pile height is determined by the length of the floats of the pile weft yarns.

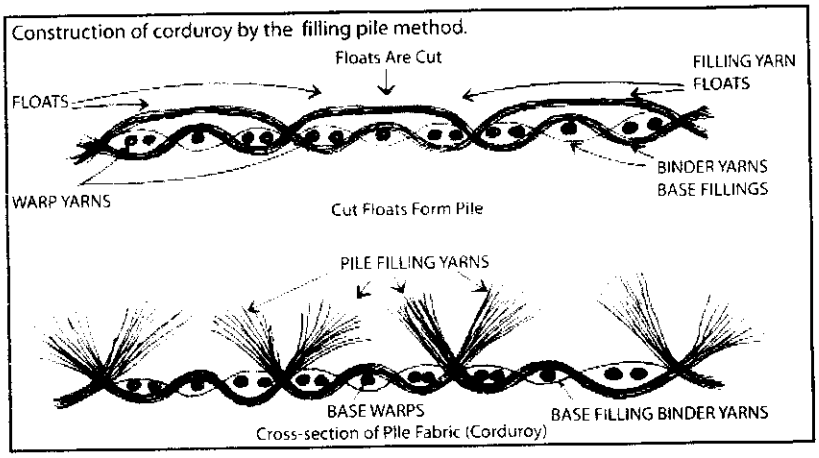
In some weft pile constructions, the weft yarn that makes the pile is interlaced with the ground one time before it is cut; in others, the filling or weft pile interlaces twice. Those fabrics in which there are two interlacings are more durable than when only one interlacing has taken place. Corduroy, velveteen, and some plushes are manufactured by this method.

Some well-known weft pile fabrics are:

1. Corduroy – Fine rib quality often used for women's wear.
2. Baby roy – Very fine rib quality, used e.g. for women blouses.
3. Velveteen – (known from the trousers) there is pile here over the entire fabric surface, but the pile not forms ribs on the fabric surface like corduroy.
4. Manchester – This is a weft pile fabric with closely woven weft often used for work trousers.
5. Stretch cord – This is a weft pile fabric with a great number of elastomer yarns in the warp. This makes the fabric elastic in length direction.

Corduroy Fabrics:

In corduroy, characterized by a pile stripe or wale alternating with a plain wale (no pile), a separate cutting knife is necessary for cutting the floats of each wale. These fabrics are woven to produce lengthwise columns of floats. The columns are formed with sufficient space between them so that when the floats in the long columns are cut and brushed, the face of the fabric has a ribbed effect. The lengthwise ribs of pile are referred to as wales.



The even spacing of corduroy floats produces a stripe or wale characteristic of this fabric Corduroys are given names according to the numbers of wales. Feather wale or cord corduroy has about 20 to 25 lengthwise wales per inch and weight 5± ounces per yd^2; Fine wale or Pinwale corduroy, about 16 to 23 wales per inch and weight 7± ounces per yd^2; Mid, medium, or regular wale corduroy, about 14 wales per inch and weight 10± ounces per yd^2; Wide wale corduroy, about 6 to 10 wales per inch and weight 12± ounces per yd^2; and Broad wale corduroy, about 3 to 5 ribs per inch.

Novelty wale corduroys are also produced in which thick and thin wales are arranged in varying patterns. Some corduroy fabrics are now made with 100% cotton yarns in the pile filling and polyester and cotton blends in the ground yarns. Other decorative effects can be achieved by cutting floats selectively to vary pattern and texture. Most weft pile fabrics are made from spun yarns.

Velveteen Fabrics:

Velveteen and weft plush, however, are produced with floats of such a length and closeness that when cut and brushed they produce an all-over, rather than a ribbed effect. They are characterized by a uniform, overall pile.

A twill-back velveteen or plush is more durable than a plain-back. Another point in durability is the way in which the pile is held to the ground. If a pile loop is pulled from the fabric, its shape will be a 'V' or a 'W'. A 'V' reveals that the pile weft has interlaced with only one warp yarn, where as 'W' reveals an interlacement with three warps. 'W' is more durable because it is held to the ground by three warps instead of one.

Velveteen has more body and less drapeability than velvet. The pile is not higher than $\frac{1}{8}$". Both corduroy and velveteen are available in solid-colour and printed fabrics.

Structurally, the velveteens may be classified as follows:

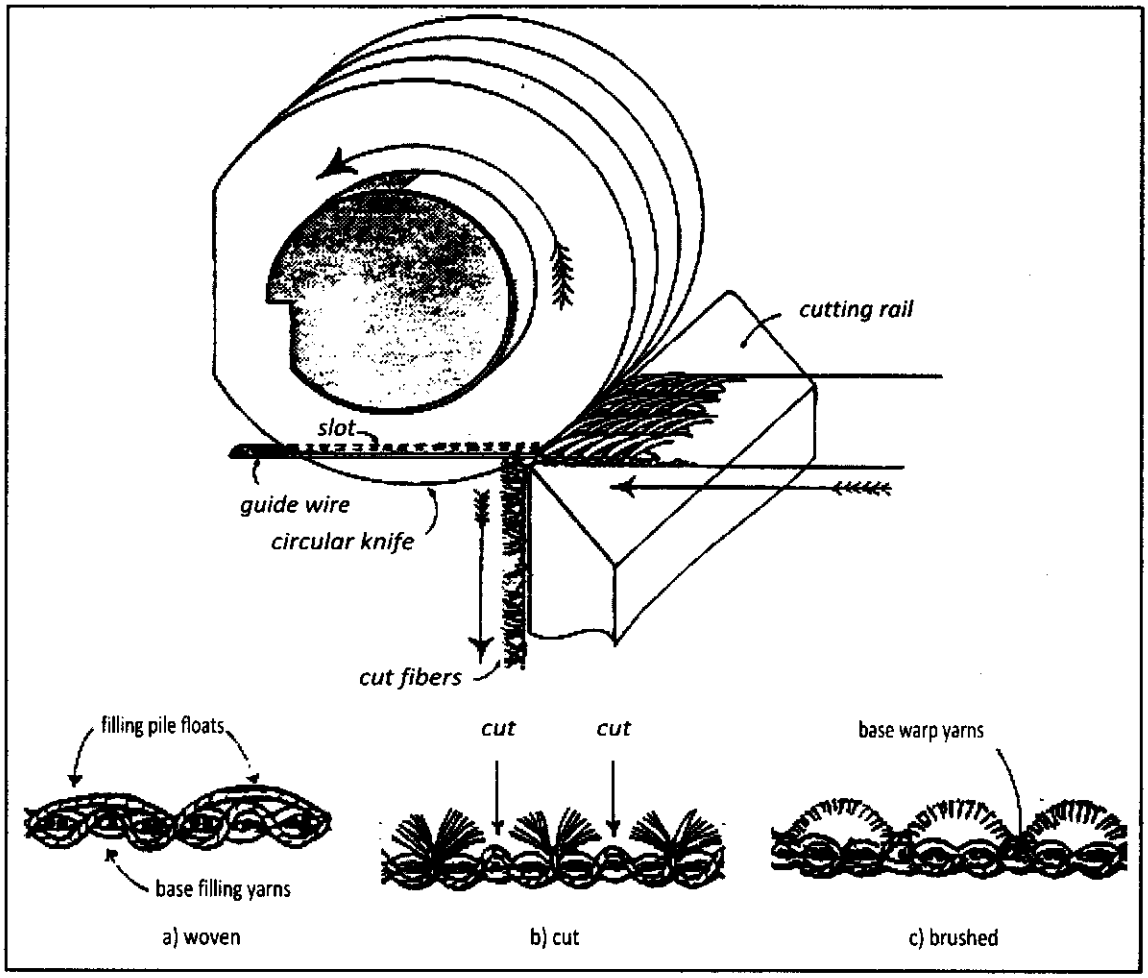
1. All-over or plain velveteens – in which the surface is uniformly covered by the pile.
2. Weft plushes – similar to above but arranged to produce much longer tufts and used mainly for upholstery purposes.
3. Corded velveteens – also known as corduroys and fustians in which the pile runs in orderly vertical cords of varying width.
4. Figured velveteens – in which pile figure is produced on bare ground.

All the above groups may be further sub-divided into plain-back or twill-back structures depending on the type of weave in which the ground picks interlace with the warp.

Float Cutting principle:

Cutting the pile is precision work to be carried out in a separate operation after weaving. Corduroy and velveteen are prepared for cutting in the same manner. The floats are treated to give them cutting surface, and the fabric is stiffened so that it will remain smooth and firm. At one time pile was cut by hand with a thin steel blade; the practice may continue in countries where labor is cheap, but machine cutting is more prevalent today. In one process, thin, flexible metal bands are inserted between the floats and the base fabric, and then circular metal knives cut down the centers of the floats over the metal band. The blades cut the floats without damage to the base fabric.

The machine used here is equipped with a great number of needles with knives. For every rib to be cut, a separate needle with knife is used. The needles are pushed as it were into the tunnels under the pile weft. The needles are split after the needle point. The circular knife turns in this groove thus cutting the pile weft yarns. After the pile yarns have been cut, the fabric surface is brushed to bring the cut ends of the pile yarns into a position perpendicular to the fabric surface.



Novel surface effects can be achieved by having different length floats or by shearing the floats to different lengths to produce patterns. Cutting some floats and leaving others uncut is another way to create interesting fabric surfaces. When wide-wale corduroy is cut, the guides and knives can be set to cut all the floats in one operation. For narrow corduroy and velveteen, the rows are so close together that alternate rows are cut with each pass and the fabric must be run through the machine twice.

It is very important that good yarn qualities should be used for the pile weft. Indeed knots, bulges etc. can block the needles which can result in long cutting faults. Rotor yarn cannot be used as pile yarn.

B. Warp Pile Fabrics:

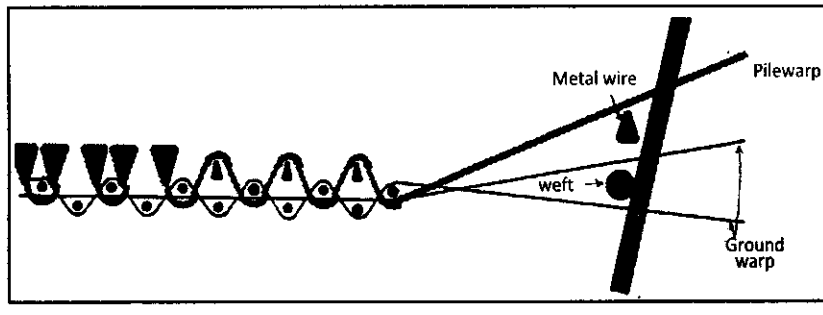
Warp pile fabrics such as terry cloth, velvet, velour, rug velvet, and Wilton and Axminster rugs are made using extra warp yarns to form the pile. One set of the warp yarns interlaces with the set of weft yarns to form the base or ground fabric, and the extra set of warp yarns is used to create the pile that can be cut or uncut.

Three general methods are used to make warp pile fabrics:

1. The Wire method,
2. The Double-cloth or Double-weave or Face-to-Face method, and
3. The slack tension pile or Terry weave method.

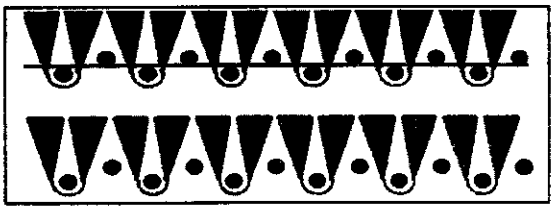
1. The Wire method:

Wire looms allow weaving of carpets with loop pile, cut pile or a combination of loop and cut pile. Carpets woven on wire looms are mainly heavy carpets for the contract market (e.g. for shops, offices, hotels, etc.), either with an all-over structure or with two or three colours. A two-colour carpet is indicated as a two-frame carpet. One of both pile colours forms the pile; the other pile yarn is the dead pile yarn and is either floating at the back of the carpet or woven in.

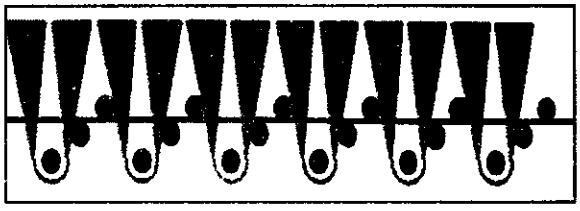


A distinction can be made between two- and three-pick wire carpets. The former (two-pick wire carpet) means that a wire is inserted in the loom after every two

picks; for the latter (three-pick wire carpet) this is after every three picks. At the reed beat-up following the wire insertion, a loop is formed over the wire. At the cloth fell, the wires stay in the carpet over some cycles. After insertion of a wire, the wire furthest away from the shafts is withdrawn from the carpet. It is necessary that the wires remain in the carpet during a number of insertions in order to obtain a strong binding of the cut pile in the ground fabric.



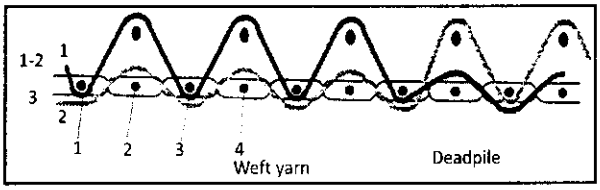
Pile every two picks



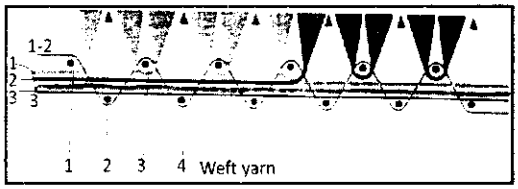
Pile every three picks

A distinction is made between cutting and looping wires:

- **Cutting wires:** These wires have a knife at the top; when the wire is withdrawn, the loop is cut, resulting in a cut-pile.
- **Looping wires:** These have no cutting edge and the loops are not cut when the wires are withdrawn. The carpet then has a loop pile.

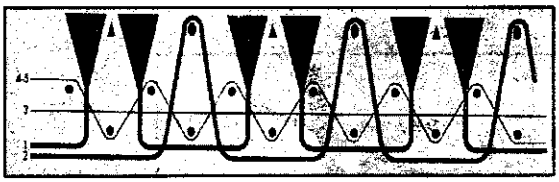


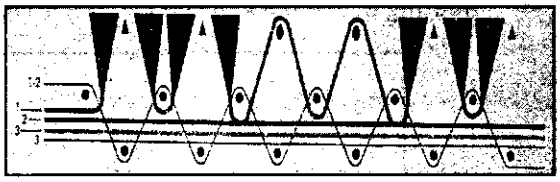
Loop pile



Cut pile

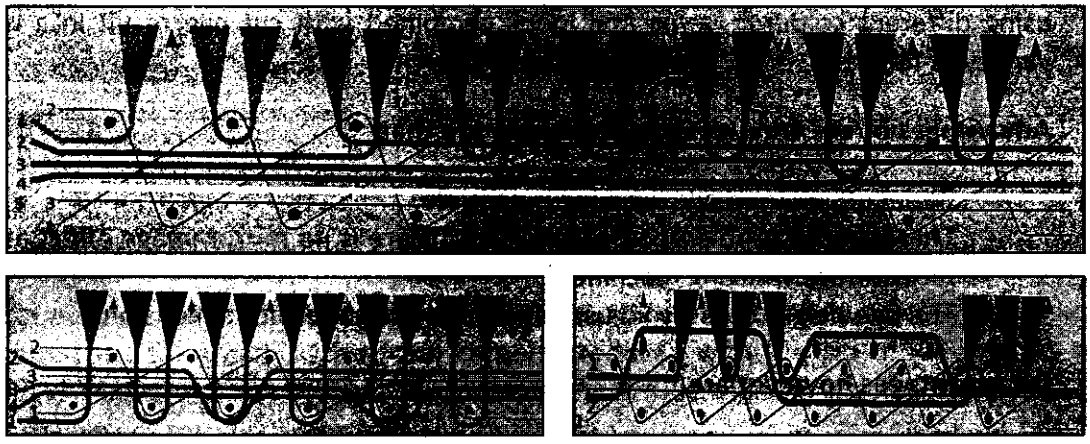
A carpet with a cut and loop pile can be obtained by combining both wire types during weaving.



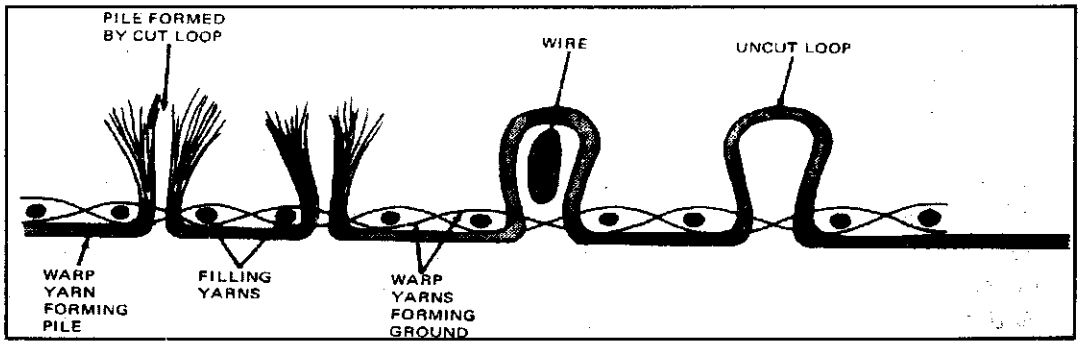


The ground warp yarns are unwound from one or more warp beams. Several beams are necessary if the crimp of various warp sets in the fabric is greatly different. The ground weave can be a plain weave either with equal or unequal tensions, or a combination of a $\frac{2}{2}$ weave with a $\frac{1}{1}$ weave; this combination is also referred to as English weave. Other ground weaves can be used. The ground warp yarns are threaded in the back shafts. Shedding of the ground warp yarns is done by means of cams. Shedding of the pile warp yarns can be done by means of cams, dobbies or

jacquard mechanisms. The pile warp yarns are unwound from one or more pile warp beams or from bobbins in a bobbin frame (creel). The way the pile yarn is set up on the loom depends on the difference in consumption of the various pile warp threads.



In the wire method, one set of warps interlaces with the weft to form the plain or twill-weave ground of the fabric; the other set of warps forms the pile. When a row of pile is made, the warp yarns to form the pile are first raised by the harness to form the shed. Then a wire is inserted through the shed, much as weft yarn is shot through. The size of the wire is determined by the size of the pile to be made. When the set of warps to form the pile is lowered, it loops over the wire and is held in place by the next weft. The wire is then withdrawn. As this is done, a small, sharp knife attached to the end of the wire cuts the pile warp loops. The ground is then woven for a certain number of picks; then the wire is again inserted to form the pile. If the pile has not been cut evenly by the wires, the fabric is sheared again with a device like a lawn mower.



Sometimes the pile is left uncut: a wire with no knife is used, or a number of weft threads are substituted for the wire and are then withdrawn. Friezé, a fabric often used for upholstery is an example of an uncut looped pile fabric or combination of cut and uncut looped pile fabric that can be made by the wire method. Friezé has fewer tufts per square inch than most other pile fabrics. The durability of Friezé

depends on the closeness of the weave. If the fabric is to have a cut pile, the wire has a knife blade at the end that cuts the yarns as the wire is withdrawn. Velvets may be made in this way. If the fabric is to have an uncut pile, the wire has no cutting edge. Velvet can also be made by the over-wire method. Complex patterns using different coloured yarns and loops combined with cut pile result in a wide variety of fabrics.

Advantages of the wire weaving technique are that:

- Both cut and loop pile weaving is possible,
- There are no problems to weave logos; there is no mirror image effect as on face-to-face weaving machines,
- The pile height is easily adjustable by changing the wire dimensions.

Disadvantages however are:

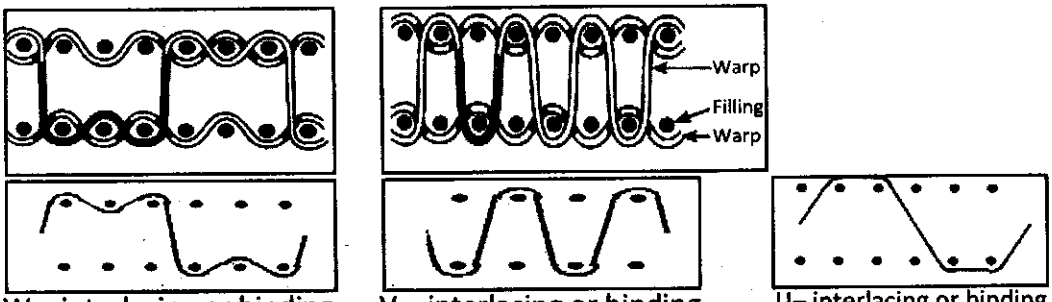
- The low production speed,
- Over-heating of the wires when they are withdrawn. This may cause problems when weaving synthetic yarns.

On traditional wire looms, the weft is inserted by means of a shuttle. On modern wire looms, rapiers are used with transfer in the middle according to the Dewas-principle. The wires are inserted in and withdrawn from the fabric by means of a special mechanism. The working of the mechanism for wire insertion considerably limits the weaving speed to 50 to 60 insertions per minute. In ITMA' 1995 it was 145 insertions per minute.

2. The Double-cloth or Face-to-Face method:

A carpet or velvet fabric produced on the face-to-face principle is formed by cutting through a double cloth or fabric. The pile yarns are perpendicular between two ground fabrics. Many average-grade millinary and transparent velvets are woven double; that is, two cloths are woven at the same time, face to face. Two fabrics are woven, one above the other, with the extra set of warp yarns interlacing with both fabrics. There are two sheds, one above the other, and one weft yarn is inserted into each shed. The fabrics are cut apart while still on the loom by a traveling knife that passes back and forth across the loom thus formin g two fabrics with facing piles. With the double-cloth method of weaving, the depth of the pile i.e. the pile height is determined by the space between the two fabrics. The pile height is changed by adjusting this distance. The interlacing pattern of the pile yarns determines their resistance to shedding, density, and durability. Pile with a 'W'-shape interlaces with more weft yarns, is more resistant to shedding, is less dense, and is more durable. Pile with a 'V'-shape interlaces with fewer weft yarns, is less resistant to shedding, is

denser, and is less durable. The plain, rib, twill, or satin weave may be used as the ground. Velvet, velour, plush and fake fur may be woven and cut apart.



W – interlacing or binding V – interlacing or binding U– interlacing or binding

The patterns on both fabrics are each other's mirror image. Once cut through, the carpets do not greatly differ from carpets produced with the aid of wires from a weave-technical point of view. The looms are less wide than wire looms, since there is no system for wire insertion. The dead pile yarns can be woven evenly in both fabrics. The cutting mechanism must cut at high speed while the knife movement at both extremities over the grindstones must be slower. It is very important not to cut during the reed beat-up because the fabric is not under sufficient tension to be cut. Cutting would then not necessarily be done in the middle.

Face-to-face weaving is the weaving technique with the highest productivity for carpet and warp velvet weaving. There are two techniques of face-to-face weaving:

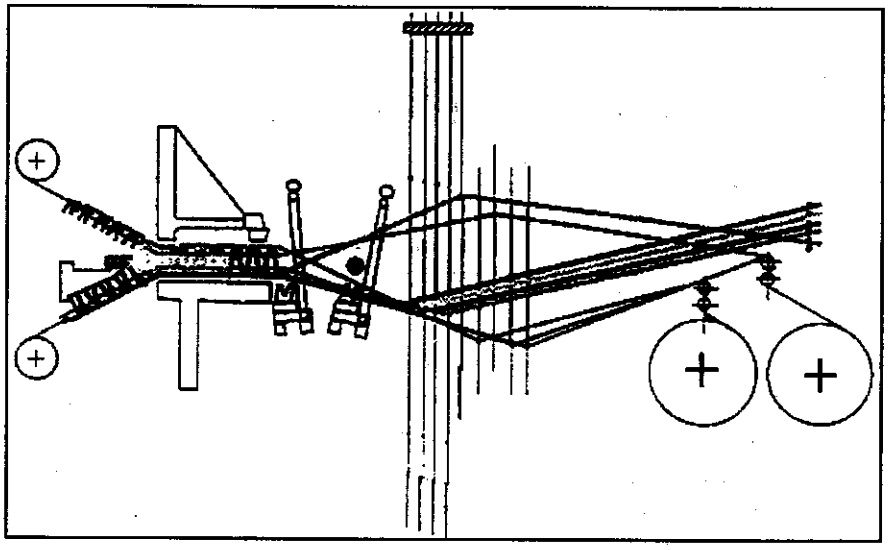
- **Single-shuttle principle:** single shed and only one mechanism for the weft insertion on the loom,
- **Double-shuttle principle:** two sheds are formed and there are two mechanisms for the weft insertion so that two wefts are inserted simultaneously: one for the top and one for the bottom fabric.

The weaves used here include:

- Plain weave with equal or unequal tension,
- $\frac{2}{2}$ 2 (hopsack weave),
- $\frac{2}{2}$ combined with $\frac{1}{1}$, with the warp yarns of the latter weave highly tensioned,
- $\frac{3}{3}$ combined with $\frac{2}{1}$, with the warp yarns of the latter weave highly tensioned.

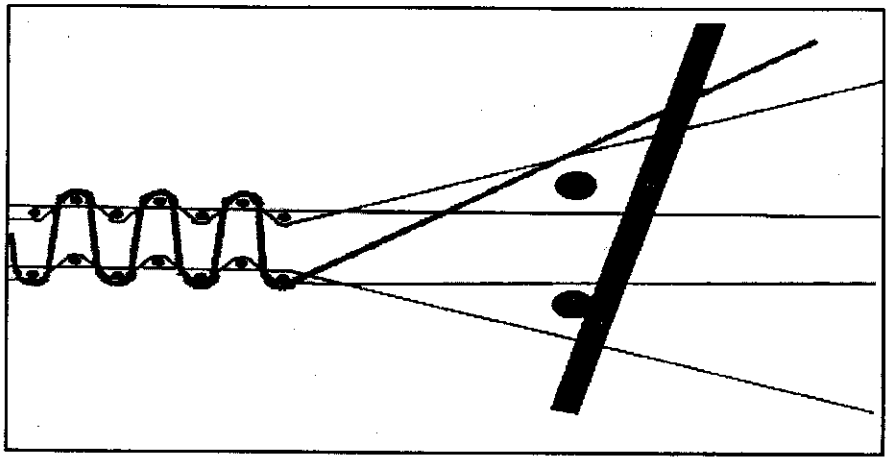
With the single-shuttle weaving technique, a loop is formed on every pick. With the double shuttle technique, a loop is formed for every two or three picks. It is also possible to work with exclusion of weftон the double-shuttle technique: a weft yarn

is inserted alternately in the top and bottom fabrics while the other insertion mechanism inserts no weft yarn. In this way, the double-shuttle technique too can provide a loop for every weft yarn.



Single shuttle principle

Traditionally, the weft was inserted by means of shuttles. Modern machines are equipped with rapiers for the weft insertion. The weave of the ground warp yarns is mostly formed with a cam mechanism. The shedding of the pile yarns can be done by means of cams, dobbies or a jacquard mechanism. For carpet looms, mainly jacquards are used.



Double shuttle principle

On single-shuttle face-to-face looms, a jacquard mechanism with two positions is enough. On double-shuttle face-to-face looms, a jacquard mechanism must be used

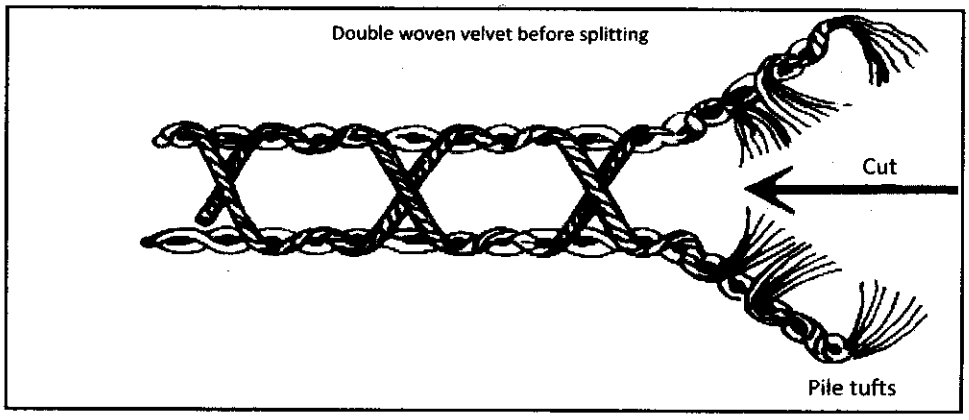
that allows three positions of the pile yarns if the dead pile yarns are to be woven in the ground fabrics. There are two techniques for this:

- **Two hooks per harness cord:** if both hooks are up, the yarn is in top position. If only one hook is up, the pile yarn will be in middle position. The pile yarn is of course in the bottom position if no hook is lifted. This system is applied on face-to-face weaving machines by Van De Wiele.

- **One hook per harness cord,** but the grid to which the pulley yarns are attached can take two positions. Combining the hook movement and the grid can give three possible positions for the pile warp yarns. These systems can be applied on face-to-face carpet looms by Van De Wiele.

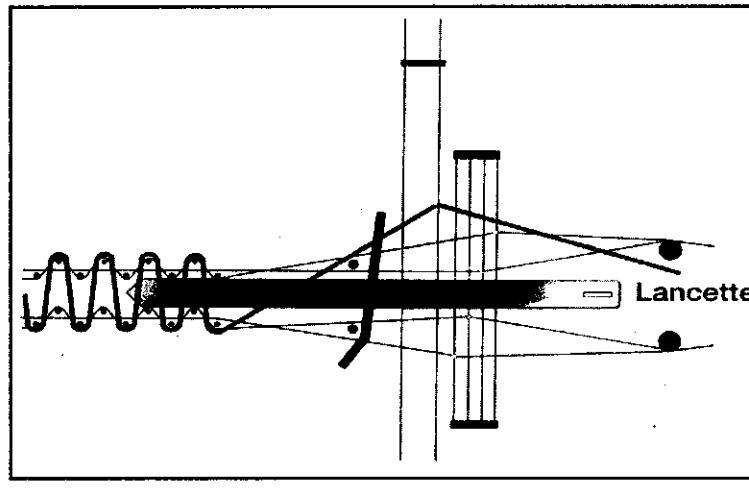
Face-to-face velvet can be woven with a mirror warp which results in a plain-coloured fabric backside. The mirror warp can be obtained with a jacquard with two positions. For weaving velvet, 'U' and 'W' bindings can be used besides the 'V' bindings.

Velvet is made of filament yarns with a pile height of $\frac{1}{16}$" or less. Velvet must be handled carefully so that no folds or creases flatten the pile.



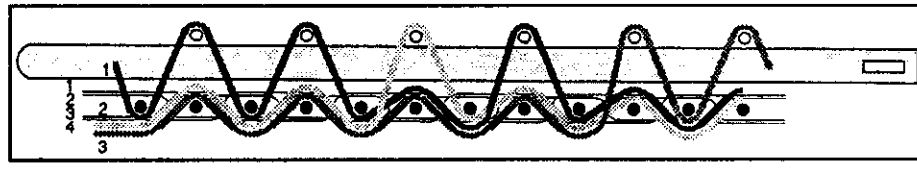
Velvet fabrics are used in a variety of applications such as jewelry boxes, film sealing, bathroom carpets, curtains, upholstery, automotive interiors, prayer mats and wall rugs. Long pile velvet is used to imitate fur and technical fabrics.

Velvet fabrics have a fluffy surface due to cut loops. Two layers of fabrics are woven together with a yarn binding them. When the binder yarn is cut, the layers are separated resulting in a fluffy surface on one side of each fabric. The following figure shows the schematic of velvet fabric weaving and formation. A bent reed and lancets are used to allow weaving with minimal shed dimensions to reduce the tension peaks on the pile warp ends. Velvet fabrics are produced by plain, dobby, or jacquard design velvet machine.

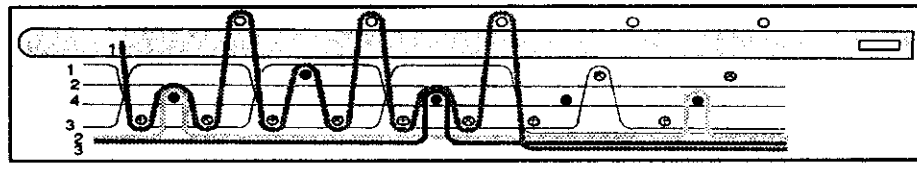


Schematic of velvet weaving

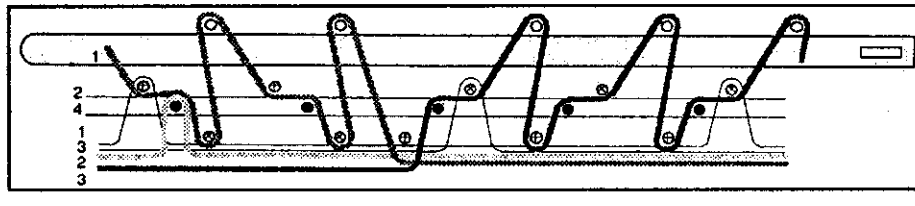
One method to form loop pile is to use lancets. False picks are inserted above the lancets to form the pile; then, the false picks are automatically removed during weaving.



By controlling the pile and base warp yarns, various weave structures can be obtained. For example, sculptured loop pile velvet can be produced with flat woven weft and warp effects as shown in the following figure.



Shadow loop pile velvet is obtained by giving a direction to the loop pile. Colour effects can be achieved using a weft selector. Any type of natural and manmade yarns are used including cotton, polypropylene, acrylic, polyamide, etc.



Velvet and velveteen can be distinguished by fibre length: velvet is usually made with filaments and velveteen with staple. To identify warp directions in these fabrics, ravel adjacent sides. In weft-pile fabrics, the pile is pushed out as individual tufts when a weft yarn is removed. But when a warp yarn is removed, the pile tufts cling to it and it looks a little like a woolly cater pillar. In warp-pile fabrics, the opposite occurs. Pile tufts cling to weft yarns.

Another way to tell warp direction is to bend the fabric. In velveteen, the pile 'breaks' into lengthwise rows because the weft tufts are interlaced with the warp yarns. In velvet, the pile breaks in crosswise rows because the warp tufts are interlaced with the ground-weft yarns. This technique works best with medium-to poor-quality fabrics. Finishing is used to create other looks for velvet.

Crushed velvet is made by mechanically twisting the wet cloth. The surface yarns are randomly flattened in different directions. Panné velvet is an elegant fabric with the pile pressed flat by heavy pressure in one direction to give it high luster. If the pile is disturbed or brushed in the other direction, the smooth, lustrous look is destroyed.

Velour is a warp-pile cotton fabric used primarily for upholstery and draperies. It has a deeper pile than velveteen and is heavier. Plush has a deeper pile than velour or velvet and is usually longer than $\frac{1}{4}$".

Fur like fabrics may be finished by curling, shearing, sculpturing, or printing to resemble different kinds of real fur. Most fur like fabrics are made by other processes.

Face-to-face velvet looms usually have lancets in order to obtain a correct pile height between top and bottom fabrics. This reduces the tension of the ground warp yarns which decreases the number of ground warp end breakages. The tension of the pile yarns is higher which reduces the risk of joining or clinging pile yarns.

As on the wire looms, the concept of 'number of frames' of the carpet or velvet is defined. The dead pile yarns can be woven in (partly in the top cloth and partly in the bottom cloth), float between both fabrics, or float at the backside of one of both fabrics. In the second and third cases, the floating yarns must be removed on appropriate machines. The technique with bound in pile yarns has the following advantages:

- No supplementary treatment is needed to remove the floating pile,
- Top and bottom carpets are equal in weight,
- The carpet is thicker (more comfort),
- Greater dimensional stability.

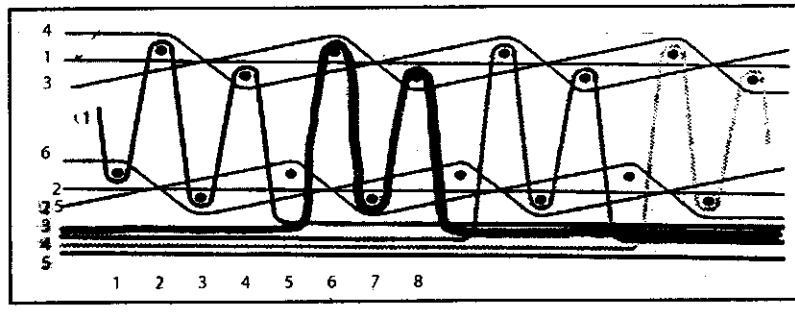
Disadvantages however are that:

- More complex and hence more expensive jacquard machines are needed,
- The jacquard machines are under heavier stress,
- The backing aspect is less nice than with floaters.

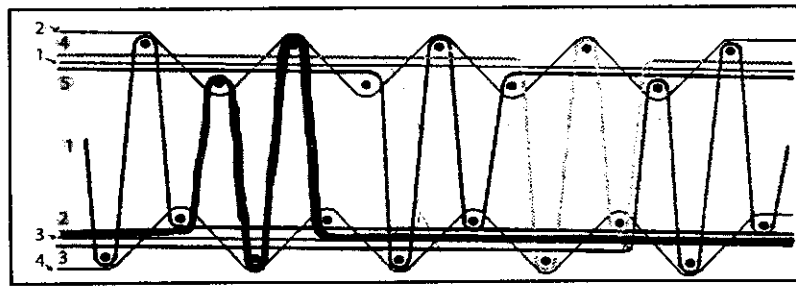
Face-to-face fabrics have technical applications. The face-to-face fabrics are not cut through then and are referred to as distance fabrics. The space between the two fabric layers can be filled with foam, sand, cement, etc. Application of such products include: acoustic or thermal insulation, pipes for warm and cold air, pipes in heat exchangers, ground or river bank fortification, sandwich boards, etc.

A recent application consists in the use of face-to-face fabrics of glass for the production of sandwich boards of composite materials. The double-cloth fabric is impregnated with resin which is then cured. The space between both fabrics can be filled for example with a foam layer. Sandwich boards made of face-to-face fabrics have a higher peel and shear strength than boards made according to other techniques.

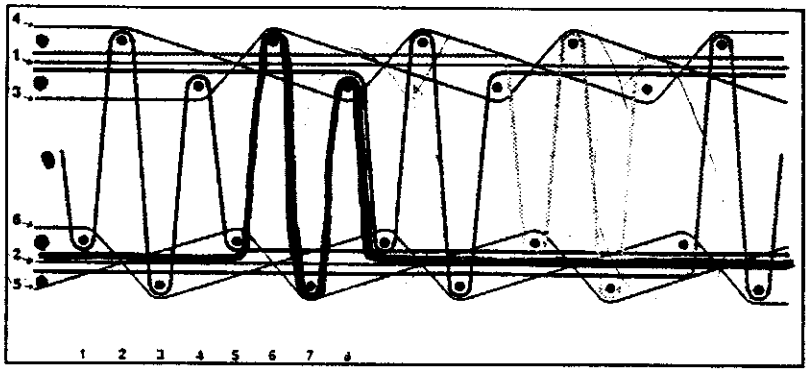
The following figures represent the examples of carpet weave structures:



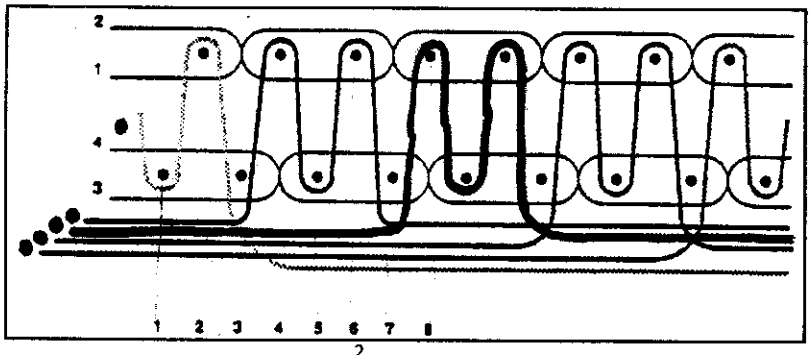
Ground weave: $\frac{2}{2}+\frac{1}{1}$ and floating dead pile



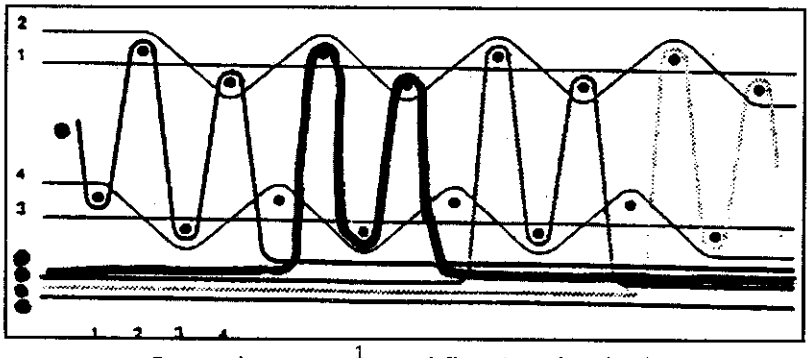
Ground weave: $\frac{1}{1}$ and dead pile woven in the fabric



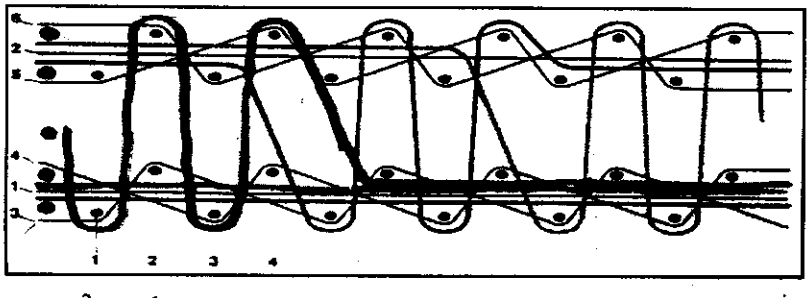
Ground weave: $\frac{2}{2}+\frac{1}{1}$ and dead pile woven in the fabric



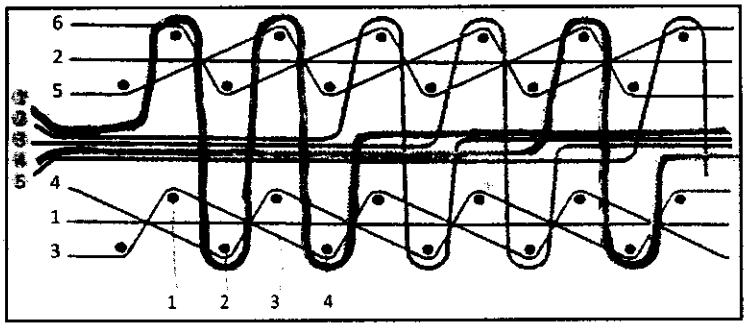
Ground weave: $\frac{2}{2}$ and floating dead pile



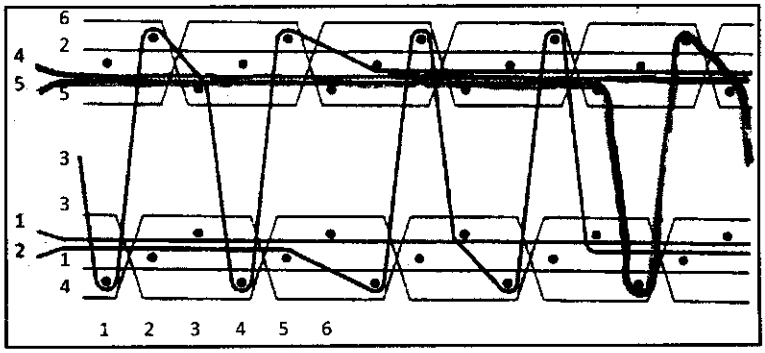
Ground weave: $\frac{1}{1}$ and floating dead pile



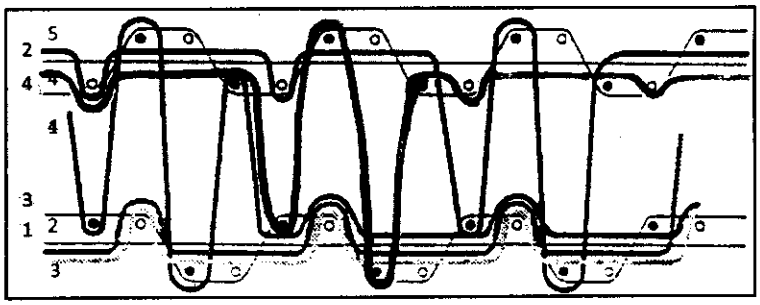
Ground weave: $\frac{2}{2}+\frac{1}{1}$, dead pile woven in the fabric and pile over every two picks.



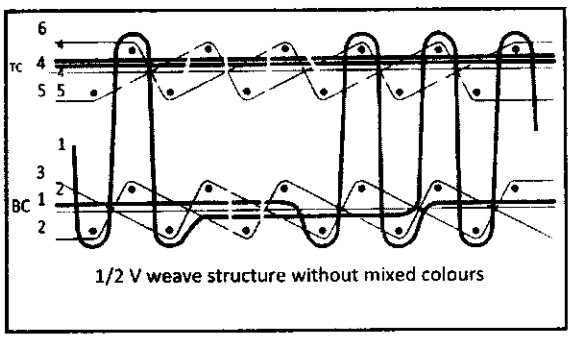
Ground weave: $\frac{2}{2} + \frac{1}{1}$, dead pile floating between both fabrics and pile over every two picks.



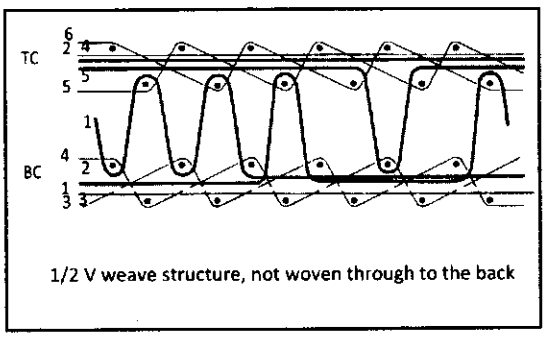
Ground weave: $\frac{3}{3} + \frac{2}{1}$, dead pile woven in the fabrics and pile over every three picks.



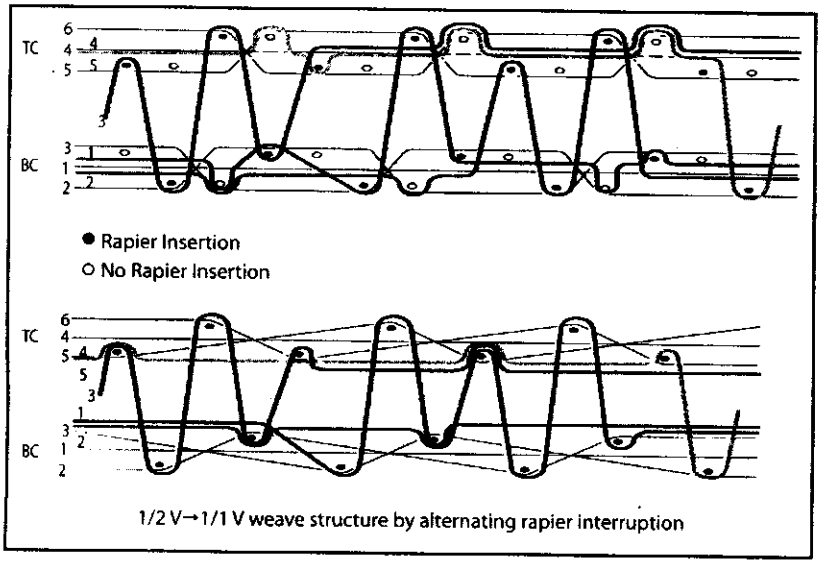
Exclusion of weft on a double shuttle loom, dead pile woven in the fabric



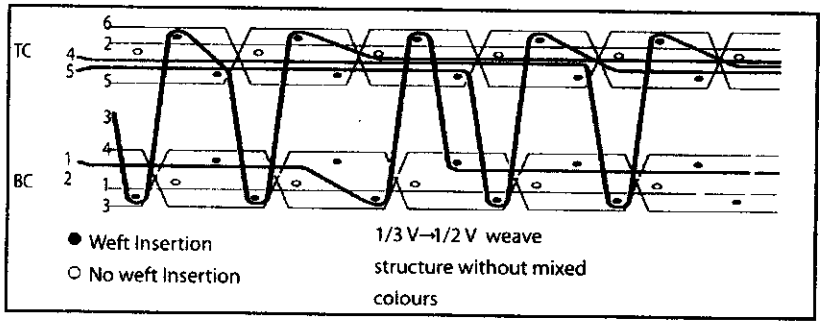
1/2 V weave structure without mixed colours



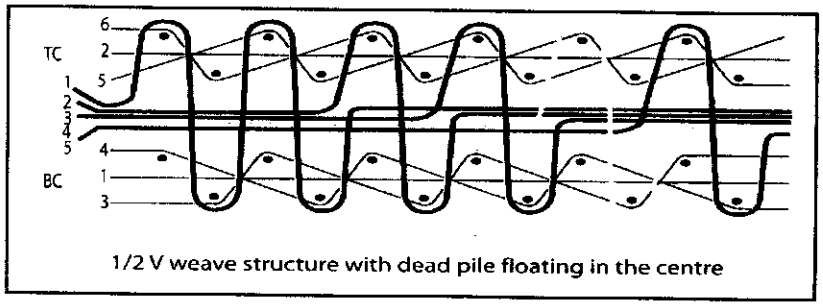
1/2 V weave structure, not woven through to the back



1/2 V→1/1 V weave structure by alternating rapier interruption



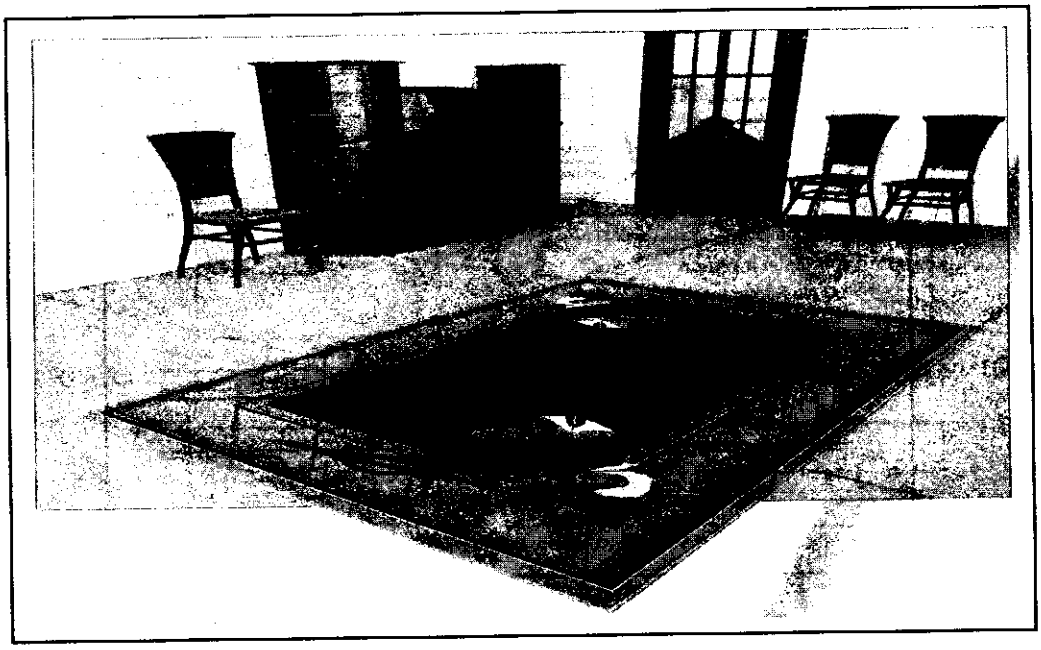
1/3 V→1/2 V weave structure without mixed colours



1/2 V weave structure with dead pile floating in the centre

Aftertreatment of Woven Carpets and Velvet:

Finishing of velvet depends on the yarn type, the weave structure and the application area of the fabric. In Europe, a back coating of the velvet fabric is avoided as much as possible, except for applications where the velvet has to meet heavy requirements. In the United States, it is common practice to apply a back coating. Further treatment of velvet consists of brushing, tip-shearing and opening the pile.



Finishing of woven carpets implies the following steps:

- Scraper to scrape off the floating dead pile where needed,
- Inspection tables for the detection of weave faults and possible repairing of faults,
- Tip-shearing and brushing the pile,
- Coating line to open the pile by means of steam and to coat the carpet back with an adhesive.

The back coating of the carpet provides better binding of the pile and a better hand as well as offering higher resistance to raveling.

3. The Slack tension Pile or Terry Weave method:

Articles made of terry fabrics are used daily in many areas. They have loops at least on one side, and usually on both sides. Most terry fabrics are produced with loops on both sides of the fabric; some velours are produced with loops on only one side. Loop height is determined by the let-off motion of the warp-pile beam.

The production of terry fabrics is a complex process and is only possible on specially equipped weaving machines. Today, terry fabrics with exclusive patterns can be produced on high speed weaving machines. On average the weight of the fabric is between 270 g/m^2 to 600 g/m^2. The most important requirements in terry weaving are:

- Low capital investment but high productivity.
- Impeccable fabric quality

- Low spare parts consumption
- Easy operation, with few mechanical settings needed
- Short style changing times

Types of Terry Fabric:

There are basically two qualities of terry, according to the loop structure:

a) Classic terry, with upright loops (made of twisted yarns). These terries are usually patterned with dyed yarns.
b) Fashion terry, also known as milled or fulled goods, with spiral loops (of single yarns). These are mainly piece dyed or printed fabrics.

A blend of single and twisted yarns produces additional pattern effects.

According to the terry aspect, three types can be distinguished:

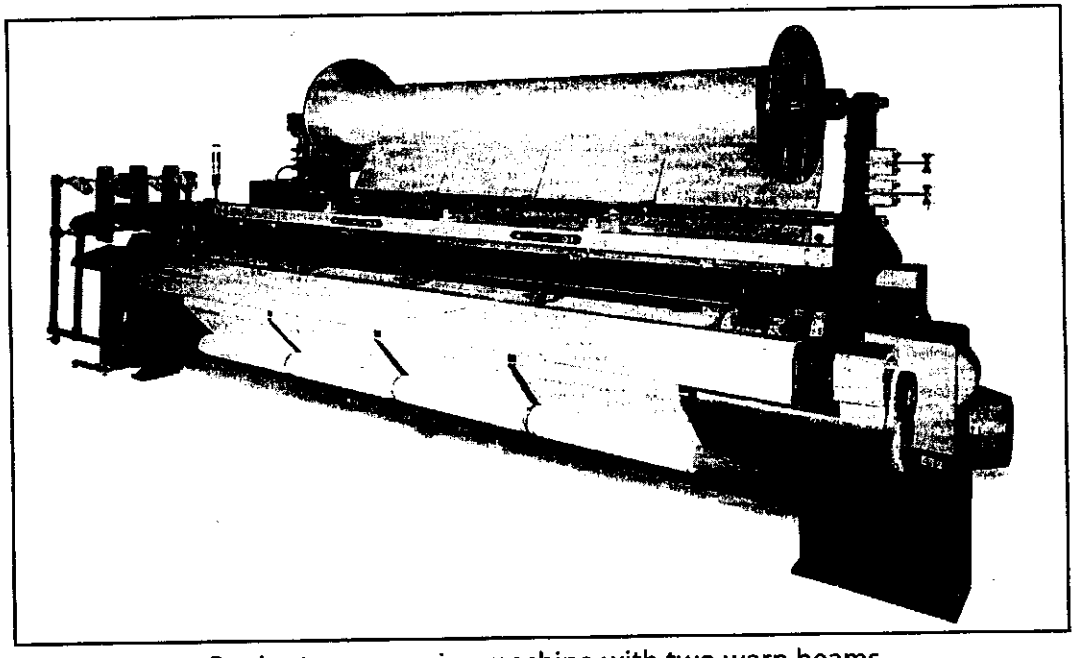
a) Terry with ordered standing loop piles: this is the type of pile fabrics which is most produced. Most of the time, unsized, bleached or dyed pile warp yarns are used in weaving which require no further aftertreatment. The first wash after purchasing the product may cause a considerable change of the aspect (the loop pile appearance).
b) Terry with irregular loop piles: twisting and reversing of pile loops is promoted during the production of the terry. Sized, ecru or dyed single yarns are used in the loop warp. These single yarns still possess great liveliness. Combined with an intensive wash during which the fabric is desized, the fabric is given its typical irregular aspect and soft hand. These terry cloths are then piece-dyed or printed. The appearance barely changes after the first domestic wash.
c) Terry with cut pile: velvet-like terry is obtained by tip-shearing the loop pile. The pile yarns open up in a brush-like manner. These fabrics have an even softer hand and even better water absorbency than terry with loop pile. Velvet toweling are high quality, expensive products.

Terry Weaving Mechanism:

In the production of terry fabrics, two warps are processed simultaneously: the ground warp, with tightly tensioned ends and the pile warp, with lightly tensioned ends. A special weaving method enables loops to be performed with the lightly tensioned warp ends on the fabric surface. In traditional terry weaving, by means of a special device on the weaving machine, two picks are inserted at a variable distance - the loose pick distance - from the cloth fell. The loose pick distance is varied according to the desired loop height. When the third pick is beaten up, the

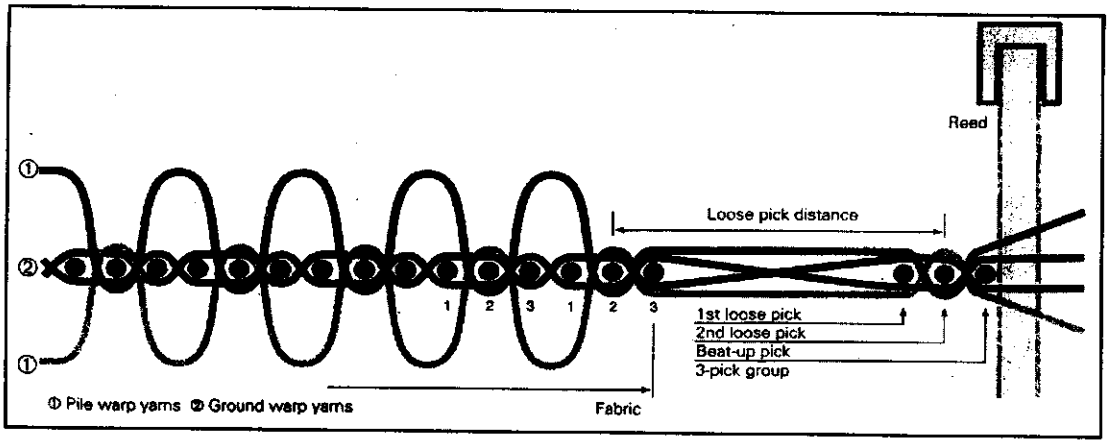
reed pushes the pick group, on the tightly tensioned ground warps, towards the fell and the loose pile warp ends woven into the pick group are uprighted and form loops. Depending on the weave, loops are thus formed on one or both sides of the fabric. With the basic method, known as three-pick terry, three picks form a pick group. It is possible to have pile heights up to 10 mm. Base weaves are usually $\frac{1}{1}$, $\frac{2}{1}$, $\frac{2}{2}$ and $\frac{3}{2}$.

The loom for terry cloth requires two warp beams. One is at the rear of the weaving machine in a plane with the weaving surface, and the second beam is placed at the back but above the weaving surface. Both shuttle looms and shuttleless weaving machines are used in making pile fabrics just as they are used for all types of woven fabric. For complex patterns the weaving machine has to be equipped with a jacquard machine. For less demanding patterns a dobby is sufficient, and very simple, non-patterned fabrics can be woven with a cam motion. The following figure shows a rapier terry weaving machine with two warp beams.

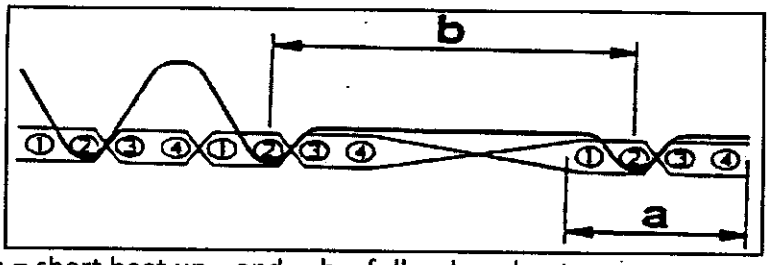


Rapier terry weaving machine with two warp beams

Quality is determined by the yarn type (carded or combed), fibre (pima, Egyptian, or regular cotton), and the number of weft yarns or picks used to create the weave. Warp yarns used for the pile in terry cloth have low twist to produce a soft, fluffy, highly absorbent surface. Common varieties include two-and three-pick terries. For example, a three-pick terry cloth, the highest quality, has two picks under the pile loop and one pick between loops. The following figure shows a three-pick terry cloth with closed loops on both sides of the fabric.

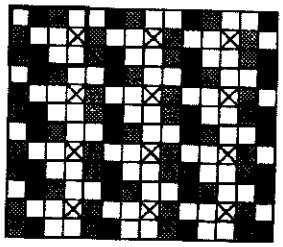


Structure and origin of a three-pick terry fabric

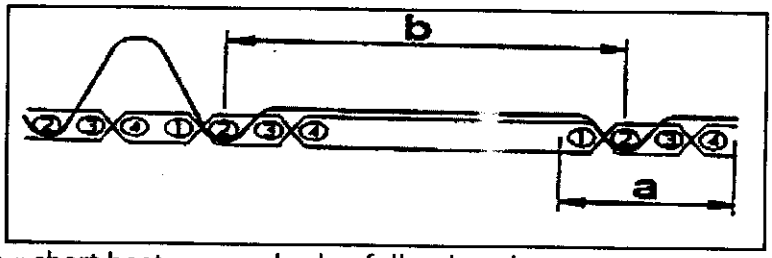


a = short beat up and b = full or long beat-up.

Four pick terry with normal weave



Weave plan of the above three-pick terry fabric

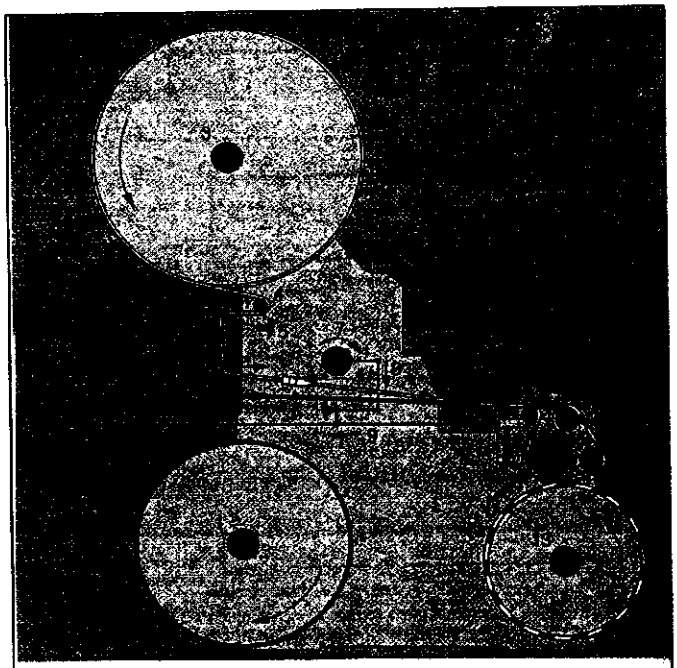


a = short beat up and b = full or long beat-up.

Four pick terry with exceptional weave

In general, the reed has two beat-up positions which do not impose alternative movements to the warp, fabric and various components of the weaving machine. The sley has a special mechanism built in which allows different beat-up positions for pile formation. Tucked in selvedge or leno selvedge are commonly used. The warp is evenly let-off by a system of constant tension control from full to empty beam, this is controlled by a highly sensitive electronic device. Air-jet machines are also successfully used in terry manufacturing. The individual components of an air-jet terry weaving machine are shown in the following figure.

As far as weaves are concerned, two types of terry are distinguished: four-pick and three-pick terry. Three-pick terry is produced most. Four-pick terry is more cost-intensive and is only applied for high-quality products. For three-pick terry, the weave of the ground warp yarns is a $\frac{1}{2}$ rib weave whereas the weave of the loop warp is a $\frac{1}{2}$ or $\frac{2}{1}$ twill weave, depending on the side where the loop is to be formed. For four-pick terry, the basket weave (or hopsack weave) is used for the ground warp. The weave used for the loop warp is a $\frac{1}{3}$ or $\frac{3}{1}$ twill weave depending on the side where the loop pile is to be formed.



1	Ground warp beam	6	Pile guide roller
2	Warp tensioner	7	Servo motor
3	Pile warp beam	8+9	Lever system
4	Guide roller for terry motion	10	Fabric table
		11	Take-up roller
5	Tension compensating roll	12	Nip rollers
		13	Cloth beam

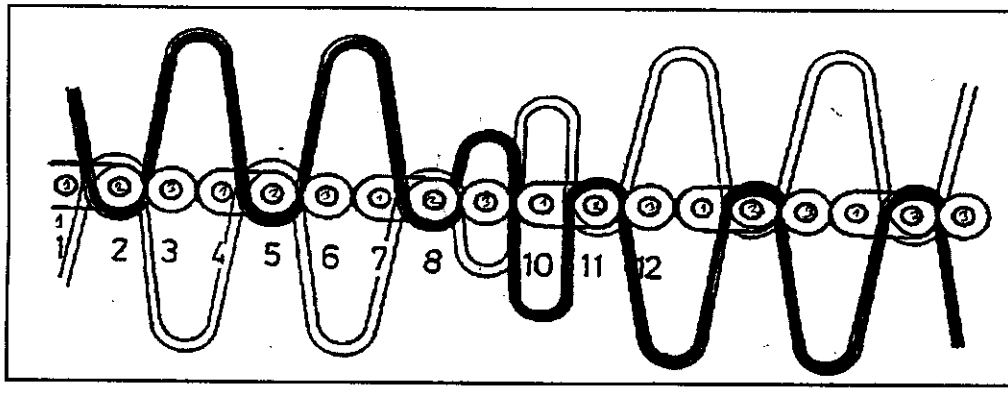
Components of an air-jet terry weaving machine

For both types of terry weave (three- and four-pick) the following rules apply:

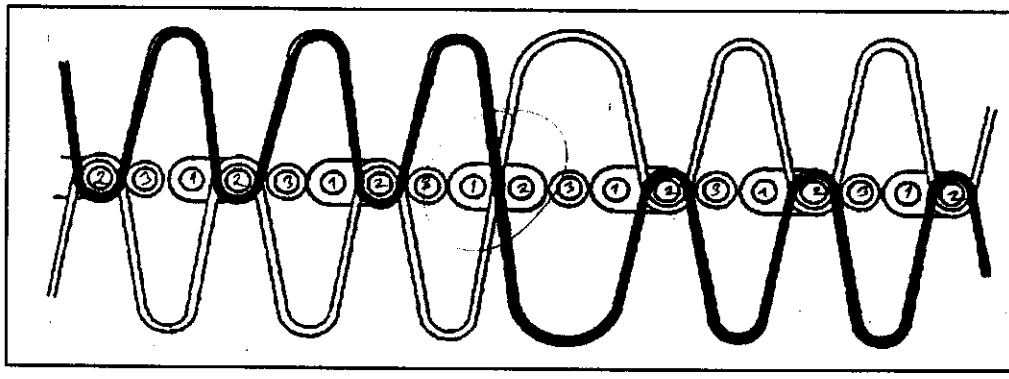
- The loop warp yarns always bind around the second weft after the full reed beat-up,
- There must be a shed crossing of the ground warp yarns after the full reed beat-up in order to avoid slipping back of the weft yarns after the reed beat-up. This rule is sometimes, albeit very exceptionally, deviated from for four-pick terry.

If the loops must be formed alternately above and under the fabric according to a certain directive, a special weave interchange is necessary. Two types of weave interchanges are used:

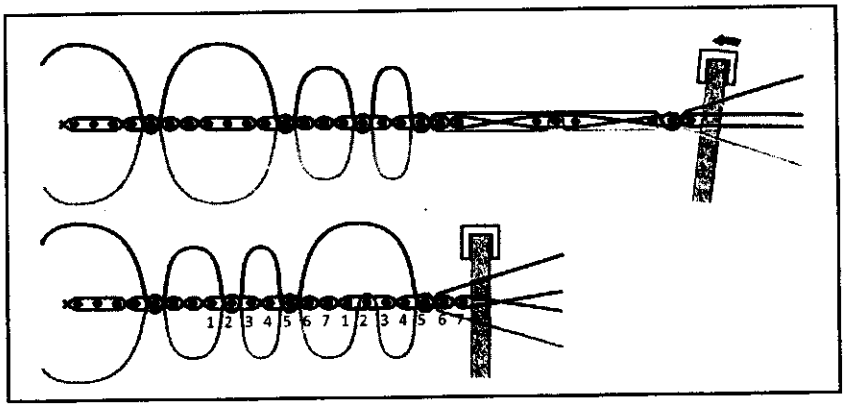
- South-German pile interchange: a disadvantage here is that the pile loops do not have the same height at the interchange. However, these loops are well bound in.



- Burghard-Vossen pile interchange: this pile crossing can be used if the pattern in the fabric requires sharp outlines. A drawback is the weak binding in of the loops at the interchange, which makes these loops easily removable.



Terry fabrics are often very complex, with different coloured warp ends in combination with loop patterns. They are subject to changing fashions, the market is constantly demanding new qualities and designs. The rapid development of electronics, with microprocessor controls and highly dynamic stepping motors in combination with modern mechanisms, has enabled fabric designers to produce completely new patterns. Three- and four-pick terry, and even fancy types of terry can be combined in the same length of fabric. The following figure shows a special seven pick weave combined with full beat up at the sixth and seventh pick. A second pile height is also formed in weft direction, making sculptured patterning possible by the difference in pile height in warp and weft direction.



Special seven pick terry design with two-pick groups and full beat-up

End Uses and Related Properties:

Terry cloth is used for bath towel, bath mats, bathrobes, beach robes, and sportswear. Each loop acts as a tiny sponge. Moreover, bathrobes are warm cloths since terry fabrics contain a lot of air. Terry fabrics are easy in maintenance; they need no ironing. Sheared loops are brushed to loosen and intermesh the fibres of adjacent yarns. The surface becomes more compact, less porous, and absorbs more slowly as compared with loop-pile terry.

Since terry fabrics are used for applications where great water absorbency is required, only fibres from natural polymers can be used. Cotton is by far most often used. Viscose presents the drawback of swelling more in wet condition, which makes viscose fabrics shrink more. Besides, viscose presents a considerable loss of strength in wet condition and viscose terry fabrics has a less soft hand than cotton terry. Institutional cotton / polyester terry towels have blended ground yarns and cotton pile; the cotton pile yarns are for absorbency and the polyester ground yarns are for strength and durability, especially in selvedges. There is no up and down in terry cloth unless it is printed. Some friezés are made by this method. Another slack-tension fabric, shagbark, has widely spaced rows of occasional loops.

Guides to the Buyer of Pile Fabrics:

If pile construction is used for silk, man-made fibres, or fur, these textiles are presented to the consumer in their richest, most luxurious textures. Pile fabrics feel soft and downy. Silk pile takes a rich, deep colour, especially when one looks directly into the pile. If the pile is pressed down, the fabric takes on a silvery, satin cast.

Pile fabrics are warm and hence are best used for fall and winter wear. Transparent velvet with a long pile and loosely woven back is not so warm as a fabric with a short pile and a tightly woven back. An all-silk velvet is warmer than a silk with a cotton back or rayon pile. Nylon pile is very resilient, resists waterborne stains, and is easily maintained.

For velvet dresses, dressmakers usually cut the fabric so that the pile runs up. The wearer then can appreciate the richness of the fabric by looking into the pile. Another reason for having the pile run up is that the pile is less likely to mat from friction. Velvet drapes well, especially when it is all silk, and looks effective in both tailored and feminine lines. Cotton velvet is stiffer and because of its bulkiness is generally more appropriate for sportswear than for lightweight dresses. Velvets and corduroys can be made spot-resistant and of durable press. Corduroys are frequently made water-repellent for raincoats. And there are some washable velvets.

In upholstery, pile fabrics look soft, cushiony, and inviting. Pile upholstery is warm-looking in summer and so may be covered with lighter fabric covers.

The Care of Pile Fabrics:

Upholstery pile fabrics should be brushed frequently with a soft brush. Brushing first against the pile and then with the pile will usually remove matted spots.

It is best to steam velvets and velveteens to remove creases and matted spots. A good way is to hang the fabric near the shower bath. Very hot water, hot enough to make steam, should be run from the shower for about ten minutes, but at no time should the fabric get soaking wet. When it is removed from the steam, it should be shaken gently and hung over a line (with the pile out) or on a hanger to dry. A garment should not be worn until the pile is thoroughly dry. Water spots can usually be removed by steaming, but other stains can best be removed by a reliable dry cleaner. Velvet that has rayon pile can be steamed the same way as silk velvet, but care should be taken not to shake it while it is wet. Two kinds of finishes are used on velvets: spot- and stain-resistant and crush-resistant. No problems are evidenced on the former type of finish; the latter may reflect light differently when pile is distorted. A steam brushing may cause the pile to resume its original erect position.

Velvets and velveteens may be steamed by still another method. Stand a hot iron upright on the ironing stand; place a damp cotton cloth over the iron to generate steam; pass the velvet slowly over the damp cloth, with the pile away from the cloth. Velvets should never be ironed flat.

The terry weave generally appears in towels, bath mats, and bathrobes. The fibres are usually cotton. Since the pile is uncut cotton yarn, the fabric washes well and should be fluffed, not ironed. The more loops on the surface of the fabric, the more absorbent the cloth. Bathmats may have rayon pile and cotton groundwork. While these fabrics are most attractive, their laundering quality and durability are questionable.

Frieze , an upholstery and drapery fabric, may be made in wool, nylon, mohair, and cotton. It is a very durable, uncut-pile fabric that dry-cleans satisfactorily, but since the dirt settles between rows of pile, frequent brushings are essential.

FLOCKED FABRICS

Main features of Flocked Fabric:

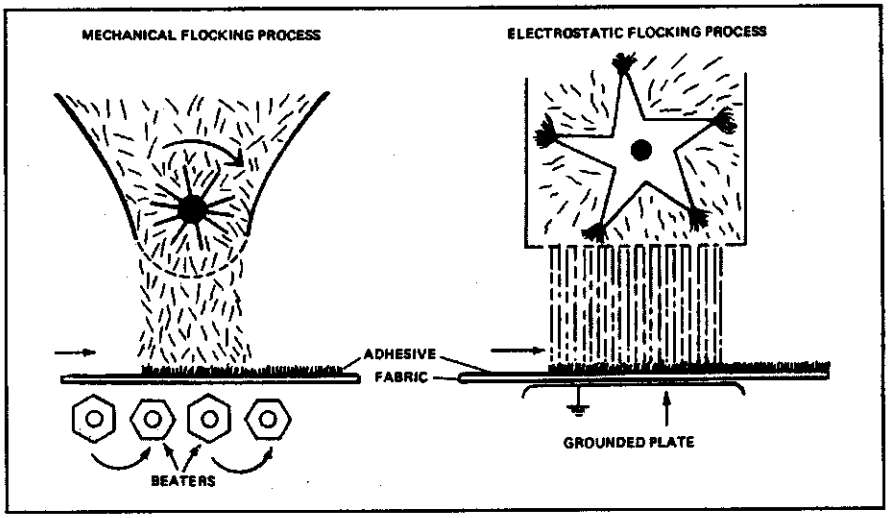
A surface effect that is similar to a nap or a pile may be created by flocking, a process in which short fibres are "glued" onto the surface of fabrics by an adhesive material. If the adhesive coats the entire surface of the fabric, the flocking will cover the entire surface of the fabric, but if the adhesive is printed onto the fabric in a pattern of some sort, the flock will adhere only in the printed areas. All-over flocked fabrics may have a suedelike appearance.

Short lengths of fibre flocking can be made from any generic fibre type. Rayon is often used for flocking. Nylon may be selected for situations that require good abrasion resistance.

Fibres for flocking are made from bundles of tow fibre (continuous filament fibres without twist). The tow is fed through a finish removal bath and then into a bank of cutters that cut flock of the desired length. The fibres may be dyed before they are attached to the fabric, or the completed fabric may be dyed.

Application of Flock to Fabrics:

The flock is applied to the fabric in one of two methods. The mechanical flocking process sifts loose flock onto the surface of the fabric to be coated. A series of beaters agitate the fabric, causing most of the fibres to be set in an upright position, with one end of each fibre "locked" into the adhesive.



The second method causes the fibres to be attached in an upright position by passing them through an electrostatic field. The fibres pick up the electric charge and align themselves vertically. One end penetrates into the adhesive, and the flock is formed. Electrostatic flocking ensures more complete vertical positioning, and the resultant fabrics are of better quality. It is a more costly process. When buying fabrics, a consumer cannot tell which process was used.

Durability of Flocked Fabrics:

The durability of flocked fabrics depends largely on the adhesives that hold the flock firmly during either laundering or dry cleaning. In some cases, flock may be removed by dry-cleaning solvents. Permanent care labels should tell the consumer how to handle flocked fabrics. A second factor in the durability of flocked fabrics has to do with the fibre from which the flock has been made.

TUFTING: TUFTED CARPETS

Introduction:

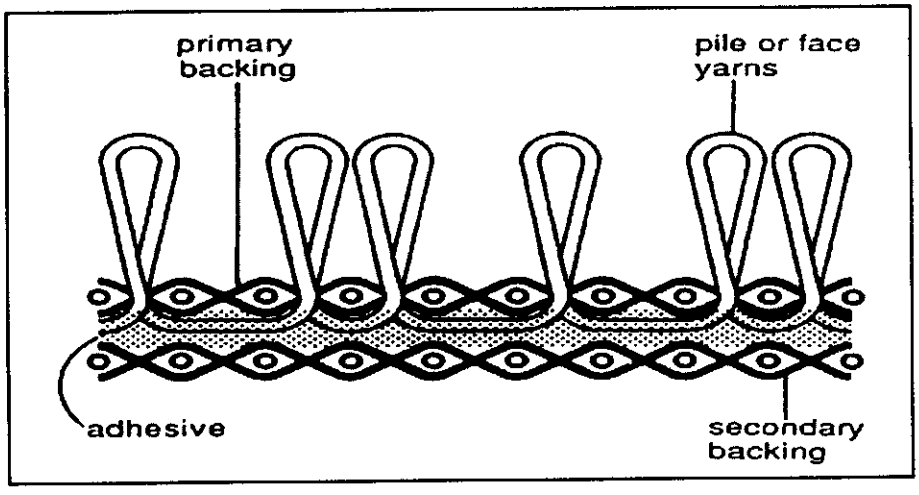
The tufting technique is a very important technique for the production of floor covering material such as pile carpets. However, it is also applied for the production of e.g. blankets, toweling, coats and fur imitations.

Tufting consists in piercing yarns through a primary support fabric by means of needles in such a way that piles (cut or loop piles) are formed on the support fabric. After further treatment e.g. anchoring the pile by means of a precoat and applying a secondary backing a completely finished tufted carpet is obtained.

So, various elements can be distinguished in a tufted carpet:

1. The pile (either cut or loop),
2. The primary support fabric or primary backing,
3. The precoat (adhesive),
4. The secondary backing.

All these elements are represented in the following figure.



Basic elements in a Tufted Carpet:

1. **Pile yarn:**

   Pile yarns for tufted carpets are usually made of man-made fibres. However, wool also takes a fairly important share. The man-made fibres are mostly the so-called Bulked Continuous Filament Yarns or BCF yarns. These bulked filament yarns are usually made

of polyamide, or sometimes polypropene or other man-made fibres. The pile yarn can contain metal or carbon fibres if antistatic properties are required.
A pile yarn should present the following properties:

- Be well wear resistant,
- Have good dyeing properties,
- Present good resilience,
- Difficult soilability,
- Easy cleanability (release of dirt particles).

Naturally, other important aspects which determine the choice of a pile yarn include resistance to micro-organisms and insects, moisture absorption capacity, hiding of dirt particles, soil resistance, electrostatic properties, flame resistance etc.

It goes without saying that the yarn should have sufficient and uniform strength so as to avoid as many breakages, and hence machine stops, as possible. Moreover, threading of the yarn through the needle eyes requires a uniform cross-section and therefore regular thickness. Knots in the yarn must be avoided. Hence, yarns must preferably be joined with latex or by air (splicers).

2. Support fabric (primary backing):

During tufting, pile yarn is stitched through a support fabric (or primary backing). It can either be a woven fabric or a non-woven (actually, a spinning fleece). Fabrics include jute, polyester filament yarn or staple fibre, polypropene tapes, glass fibres etc. Non-wovens are mainly based on polyester and polypropene (sometimes blended with polyethylene).

Whilst before the fabric was almost always based on jute, nowadays this has almost completely disappeared. Indeed, jute contains oils which can penetrate the pile and thus cause soiling and problems when dyeing. Also, jute is less rot resistant and therefore subject to micro-organisms.

Polypropene is an important substitution product for jute. Fabrics made of polypropene tapes, usually in plain weave, have a mass of 80 to 150 g/m^2. These are thin fabrics, which can easily be pierced and are suited for all needle gauges. Such material is dimensionally stable, but is sensitive to high temperatures (> 170^{0}C). Fraying at the border can be avoided by applying a butyl coating on the warp and weft threads. Examples of such fabrics of polypropene tapes are polybac, polital etc. Polybac FLW is also a fabric made of polypropene tapes but with a nylon cap needled on it. When dyed, the colour difference between the polypropene and the pile yarns will be masked by the application of this nylon fleece since nylon takes up dyestuff more readily than polypropene. Fuzzback is another example of such a construction.

Fabrics made of polyester filament yarn consist of highly shrinkable yarns of 1,100 dtex and with a weight up to approx. 120 g/m^2. Such fabrics are strong, not sensitive to

temperature differences, can be stretched well, are not thick and can easily be pierced. An example is the TTT-fabric by Hoechst (Trevira-Tufting Träger). Some disadvantages include less favourable pile anchoring, a tendency towards bowing (also in case of polypropene fabrics) and the fact of not being suited for all stitch gauges.

Apart from woven fabrics, there are the non-woven such as spun-bonded fabrics made of polypropene. An example is Typar (Du Pont) which is suited for all gauges and has no tendency towards bowing. As mentioned above, this material is sensitive to high temperatures and cannot be stretched well. Further, there are the non-wovens made of staple fibres, e.g. Loktuft. It can be strengthened with polyamide yarns. The fibre fleece weight ranges between 90 to 190 g/m^2. Non-wovens present little or no resistance to the needle when piercing. This furthers uniform pile height and placing of the loops (tufts).

A non-woven used for the primary backing can also be based on polyester filaments. For example, Reemay and Tyvek by Du Pont with a mass up to 120 g/m^2. Such non-wovens are suited for all stitch gauges, give good pile anchoring and present no tendency towards bowing. These non-wovens are fairly sensitive to temperature changes, are difficult to stretch and are not cheap.

3. **Precoat:**

The pile which is applied on the primary backing, must be anchored during a following operation. Such anchoring improves the dimensional stability, gives better sound and heat insulation, good shear resistance, etc. Anchoring is done by applying a precoat. This is either a latex (natural or synthetic rubber) or a dispersion on the basis of polyvinylacetate, polyvinylchloride, polyurethane or polyacrylate. In many cases, a rubber is used as precoat. After applying the dispersion, the latex must be polymerized at the appropriate temperature and with the appropriate means (initiators, catalysts, etc.).

When applying the precoat, a conductive material (carbon) can be added to it, even if measures had already been taken to make the pile layer conductive. Sometimes, even a flame resistant product is added.

4. **Secondary backing:**

After this (first) precoat, a second layer or foam coating can be applied, i.e. the secondary backing, which enhances comfort, strength and dimensional stability of the whole. Applying this layer is done in a continuous process after applying and polymerizing the first layer. Mostly, this is a latex of synthetic rubber to which a large amount of fillers (e.g. chalk = $CaCO_3$) is added. The material to be applied forms a 'foam'. Applying the right temperature in an oven causes polymerization and hence formation of the secondary backing.

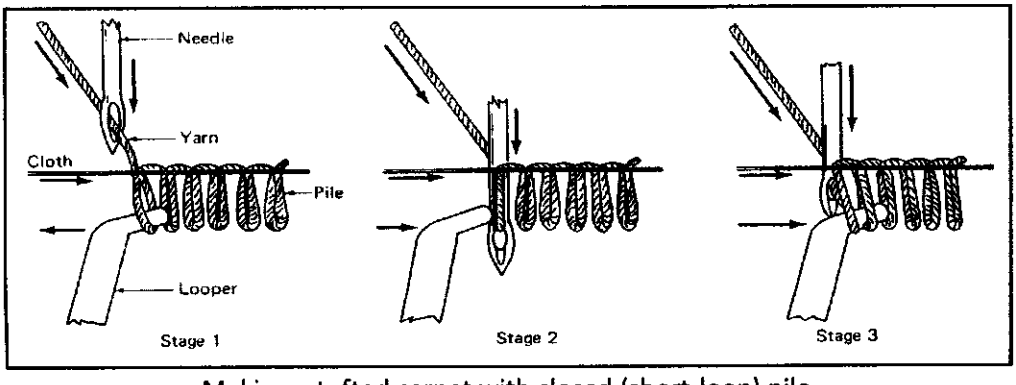
Before the secondary backing is fully cured, it can be treated with an engraved calendar roller which gives an embossed pattern. So, the plastic condition of the material at that moment is used here. An embossing gives extra resilience and anti-slip capacity. Subsequently, definitive curing is carried out: approx. 140^{0}C for a rubber latex and approx. 180^{0}C for a polyvinylchloride foam backing.

A jute fabric can also be applied (glued) as secondary backing, possibly a spun-bonded based on polyolefin filaments. An example is Action Bac (Amoco Fabrics and Fibre Company). Further, there is also Milliback (Milliken): the basis is a glass fibre to strengthen a vinyl-based precoat. Another possibility is TTC (Thiocol Ten Cate).

Tufting process:

Tufting consists in piercing a yarn through a primary backing by means of needles (on a needle bar). A loop is formed at the bottom side of the support fabric when the looper comes into operation with the yarn when the needle returns. Eventually, the loop may be cut which gives a cut pile tufted carpet in contrast to a loop pile tufted carpet (not cut).

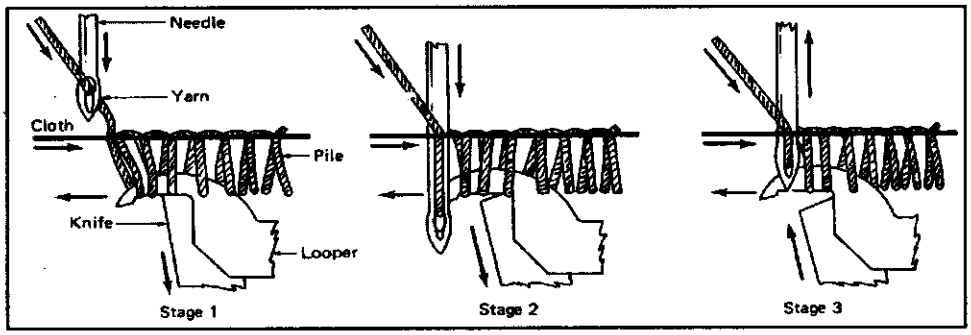
The working of a simple tufting machine is described as follows. The movement of the needles, which must pierce the pile yarn through the primary backing, is controlled by the head shaft with eccentric discs, via crank shafts and pressure shafts. The fine needles, which are mounted on the needle bar, are given an up and downward movement. The pile yarn is supplied constantly and regularly via the feed rollers. The primary backing (substrate) is fed by spiked roller.



Making a tufted carpet with closed (short-loop) pile

If the needles pierce through the primary backing, the resulting loops must be held under the support fabric by the loopers fixed on a shaft. The distance between the loopers and the support fabric determines the desired pile height. The tension device of the pile yarn keeps the pile backs close to the bottom side of the primary backing.

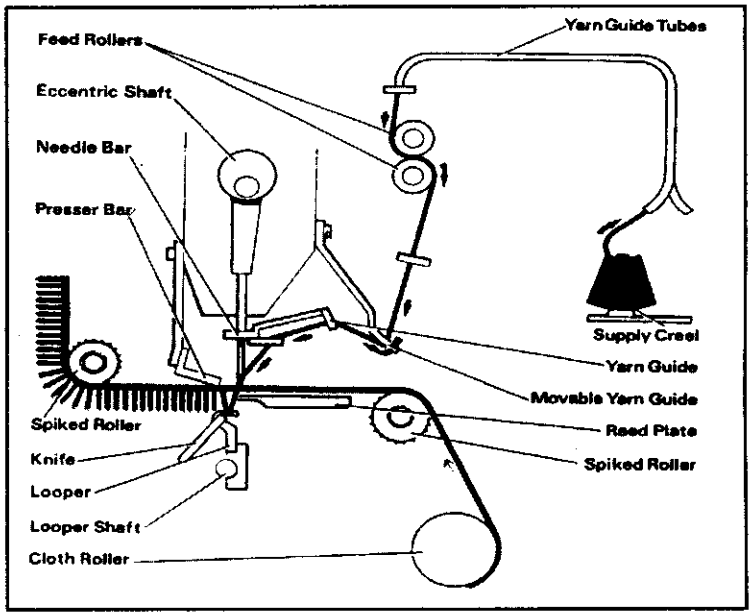
If the support fabric or non-woven passes over the reed plate (or support table), the loopers withdraw and the loops come free. The needles with the pile yarn which pierce through the backing, move up again and the loopers return in the pile loops formed: this gives a loop or closed pile carpet.



Making a tufted carpet with open or cut pile

When making a carpet with cut pile, the loopers are in a direction opposite to the one above (loop pile). Here too, a support fabric passes over the reed plate while the needles with the pile yarn pierce through the substrate. The loops formed lie over the looper and must be cut by means of inclined knives moving up and down.

The following figure gives a schematic representation of the formation of a tufted carpet with cut pile.

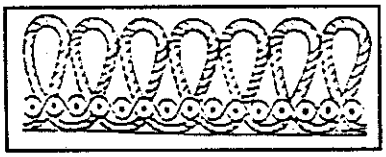


The pile height of a tufted carpet depends on the delivery of the pile yarn, the length of the needles and the distance between the primary backing and the loopers. The pile height ranges from 3mm to over 40mm. A high cut pile is applied for so-called shag carpets. In case of a non-cut pile, pile height reaches approx. half the height of that of a shag carpet.

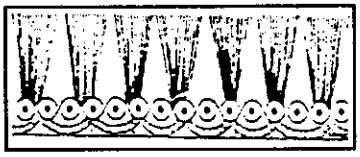
An important concept on a tufting machine is the gauge: i.e. the distance between two successive needle points expressed in inches. The gauge determines, for example, the pile

density. The gauge most often used is $\frac{5}{32}$ inch; $\frac{1}{8}$ inch is also a frequently used gauge. Machines with a fine gauge often have a gauge of $\frac{1}{10}$ inch, $\frac{1}{12}$ inch or even $\frac{1}{20}$ inch. These machines are used, for example, for fine carpets with loop pile for the 'object market' as in nursing homes, hospitals, hotels, schools, supermarkets, etc. Sometimes they are also used for blankets, fur imitation, toweling, etc.

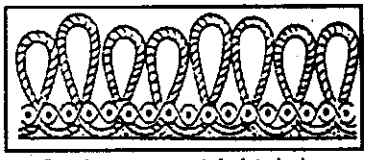
Major Tufted Carpet Construction:



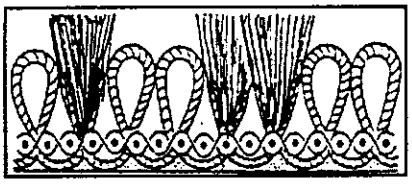
Tufted carpet with loop pile



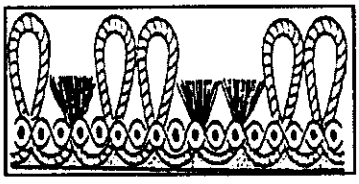
Tufted carpet with cut pile



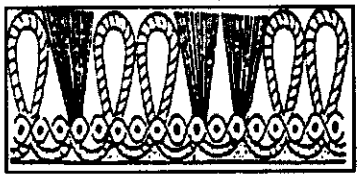
Tufted carpet with high-low structure



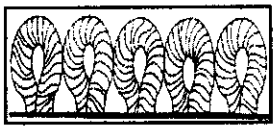
Tufted carpet with low loop pile and high cut pile



Tufted carpet with high loop pile and low cut pile

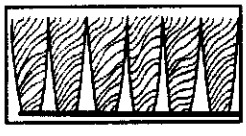


Tufted carpet with level-sheared pile



Level loop

Velvet plush



saxony

Cut and loop

Other End Uses for Tufted Fabrics:

Some tufted fabric is made in light weights for use as apparel fabric and home furnishings such as bedspreads and upholstery. The tufted bedspreads often resemble traditional chenille bedspreads; the upholstery fabrics have the appearance of woven velvet. Tufted fabrics can also be used for automobile interiors. Blanket fabric can be constructed by forming loops on both sides of a base fabric and then cutting and often napping the loops to create the blanket's surface texture. Tufted blankets have been more popular in Europe than in the United States.

Care of Tufted Fabrics:

Care of tufted fabrics that can be safely and conveniently cleaned at home depends on the fibre type used, the closeness or looseness of the pile or tufts, the type of yarn structure (simple or complex), the presence or absence of an adhesive binder on the back of the fabric, and the size of the article. Most tufted fabrics found in household articles or apparel that are small enough to fit into home laundry equipment are washable. However, where care labels are provided, it is essential to follow all directions carefully.