LECTURE NOTE

SUB: TEXTILE DESIGN - I

BRANCH: - TEXTILE ENGG.

SEMESTER: 4TH

GOVERNMENT POLYTECHNIC, BHADRAK

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SYLLABUS

1. Basic Weaves

1.1 Differentiate woven, non-woven, knitted structures.
1.2 Explain representation of weaves and use of point paper.
1.3 Describe drafting, lifting, denting plan of a design on point paper.

2. Plain Weaves and its derivatives

2.1 Basic concept of Plain-woven structure.
2.2 Construct standard plain weaves and its derivatives like Warp rib, weft rib and matt etc
2.3 Ornamentation of plain weave
2.4 Explain the application of these weaves in different field of Textile.

3. Twill Weaves and its derivatives

3.1 Basic concept of twill weaves.
3.2 Explain influence of twist direction and angle of twill on appearance of fabric.
3.3 Construct Derivatives of Twill design – Balanced and Un balanced twill, pointed twill , combined twill (end and end, pick and pick Combination.), broken twill etc.
3.4 Construct Diamond & Corkscrew.
3.5 Construct satin & Sateen.
3.6 Explain the application of these weaves in different field of Textile.

4. Simple towelling & Curtain Fabrics

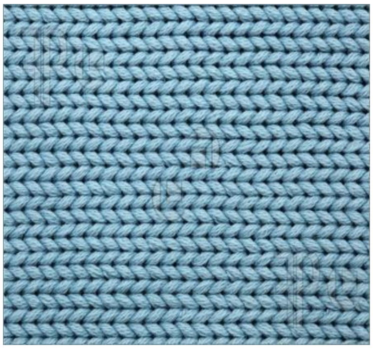
4.1 Construct ordinary honey comb, brighton, Huck-a-Back, Mock leno with draft and peg plan;
4.2 Explain the application of these weaves in different field of Textile.

5. Compound structures

5.1 Construct Bedford cords(Plain & twill faced with wadding effect) & welts design;
5.2 Construct Extra warp and Extra weft designs with drafting & lifting.
5.3 Explain the application of these weaves in different fabrics.

Basic Weaves

Difference between woven, non-woven, knitted structure

Sl. No.	Woven Structure	Knitted Structure	Non – Woven Structure
			
1.	Fabric is made by interlacement of threads.	Fabric is made by interlooping of threads.	Fabric is made by bonding of long fibres using heat, chemical or mechanical treatment.
2.	Two sets of threads – Warp & Weft – are used in making the fabric.	One or one set of thread (s) either warp or weft is used in in making the fabric.	Fibre is used instead of threads for making the fabric.
3.	It requires more no. of preparatory process.	It requires less no. of preparatory process.	No preparatory process is required
4.	Fabric is comparatively more rigid.	Fabric is comparatively less rigid.	It may be soft or rigid.
5.	Fabric is less stretchable	Fabric is more stretchable	Fabric is less stretchable
6.	It is easy to tear the fabric	It is difficult to tear the fabric	It depends on the manufacturing process of the fabric.
7.	Fabric has low wrinkle (crease) resistance	Fabric has high wrinkle (crease) resistance	Wrinkle (crease) resistance varies from low to high
8.	Fabric is stiffer and has harsh feel	Fabric is less stiff and has soft feel	It can be stiff & harsh as well as soft & resilient
9.	Fabric is less porous and air permeable.	Fabric is more porous and air permeable.	Fabric porosity may very according to the end use of the fabric.
10.	Fabric is stronger and durable.	Fabric is comparatively weaker and less durable.	Fabric strength and durability depends upon the manufacturing process.
11.	Moisture absorption power is less.	Moisture absorption power is more.	Moisture absorption power ranges from low to high.
12.	Dimensional stability of fabric is good.	Dimensional stability of fabric is poor.	It has moderate fabric dimensional stability.

Representation of weaves and use of point paper.

Methods of weave representation

A weave is the interlacing pattern of the warp and weft. Two kinds of interlacing are possible:

(i) Warp overlap in which warp is above weft
(ii) Weft overlap in which weft is above warp

When the warp is lifted above the inserted weft, a warp overlap is obtained. When the warp thread is lowered, the weft thread is inserted above the warp thread and the weft overlap is obtained.

There are two practical methods of weave representation:

(i) Linear
(ii) Canvas

In the linear method each warp thread is represented by a vertical line and each weft thread by a horizontal line. The point of intersection of lines corresponding to a warp overlap is marked by the dot, and the point of intersection corresponding to weft overlap remains unmarked. Though this is a simple method, it is seldom used because the designer has to draw plenty of horizontal and vertical lines, which is time consuming.

In the canvas method, a squared paper is employed, on which each vertical space represents a warp thread and each horizontal space represents a weft thread. Each square therefore indicates an intersection of warp and weft thread. To show the warp overlap, a square is filled in or shaded. The blank square indicates that the weft thread is placed over the warp i.e. weft overlap. Several types of marks may be used to indicate the warp overlap. The 'x' mark is most commonly used.

A weave diagram is shown below (Fig.).

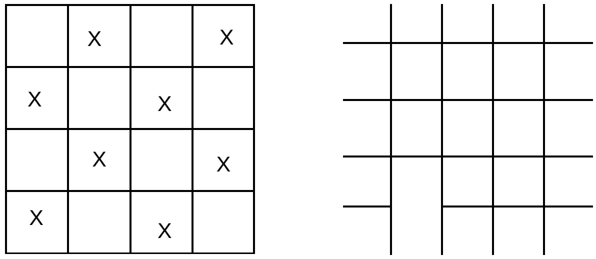


Fig. *Weave representation (Canvas method)*

Weave repeat (repeat size)

The repeat of a weave is a quantitative expression of any given weave. It indicates the minimum number of warp and weft threads for a given weave. It comprises of warp and weft repeat. The size of the repeat may be even or uneven depending upon the nature of the weave. In elementary weaves such as plain, twill, satin etc. the repeat size is normally even. However, in weaves such as honey comb, huck a back the repeat size may be even or uneven. For any weave the repeat size is the sum of the warp and weft floats. Thus, in case of a 2/1 twill the repeat size is 3 / 3. It is common practice to denote one repeat of a weave on design paper.

Basic elements of a woven design

The three basic elements in a woven design are:

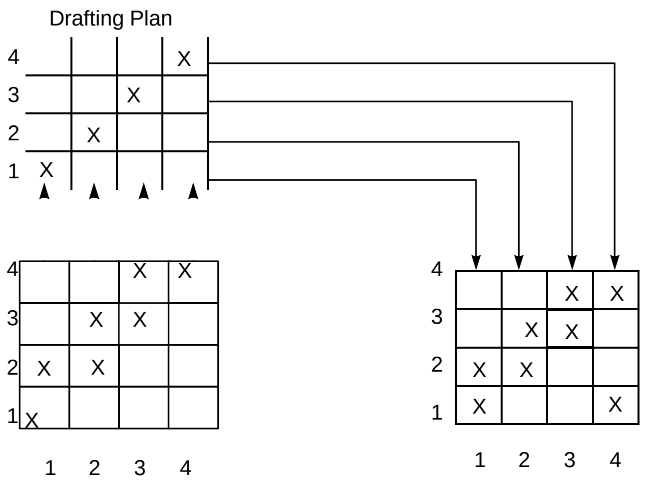
(i) Design
(ii) Draft or drawing plan
(iii) Peg or lifting plan

The design indicates the interlacement of warp and weft threads in the repeat of the design. It is made up of a number of squares, which constitute the repeat size of a design. The vertical direction of the squares indicates the picks and the horizontal direction indicates the ends. A blank in a square indicates that a warp goes below the corresponding weft and 'X' mark in the square indicates that the warp floats above the weft.

The draft or drawing plan indicates the manner of drawing the ends through the heald eyes and it also denotes the number of heald shaft required for a given weave repeat. The choice of the type of drafting plan depends upon the type of fabric woven.

The peg or lifting plan provides useful information to the weaver. It denotes the order of lifting of heald shafts. In a peg plan the vertical spaces indicate the heald shafts and the horizontal spaces indicate the picks. The peg plan depends upon the drafting plan. In the case of a straight draft, the peg plan will be the same as the design. Hence no peg plan is necessary in the case of a straight draft.

The design, draft and peg plan are illustrated with the aid of an example shown below (Fig.)



Design

Peg plan

Types of draft plans

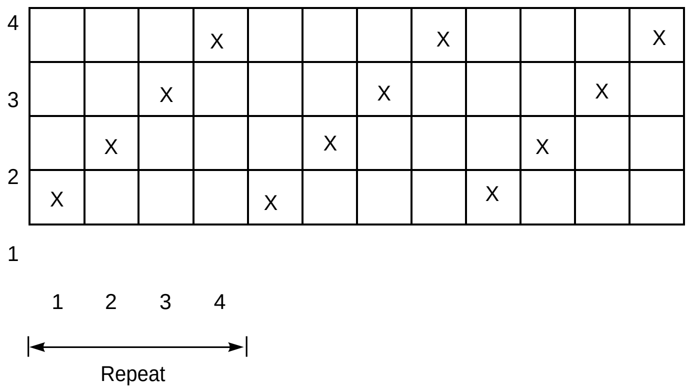
The various drafts are classified as follows:

(i) Straight
(ii) Pointed
(iii) Skip and sateen
(iv) Broken
(v) Divided
(vi) Grouped
(vii) Curved
(viii) Combination

Straight draft

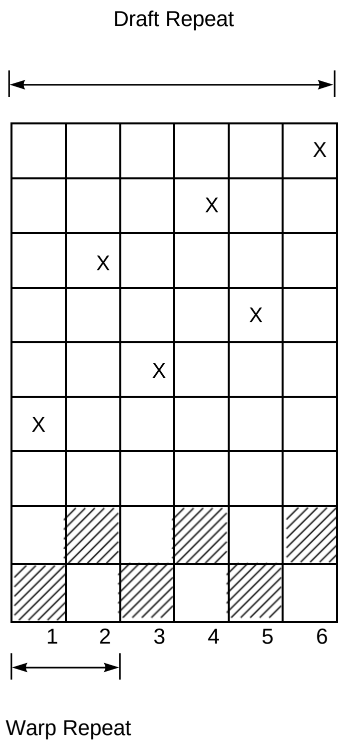
This is the most commonly used draft. It is the simplest of all the types of draft plans. In this kind of draft the drafting order progresses successively from first to the last heald frame. Thus the first warp end of a weave is drawn through the first heald shaft, the second warp through the second heald frame and so on.

One important feature of the straight draft that distinguishes it from other types of draft plans is that the peg or lifting plan is same as the design. Hence it is sufficient to indicate only the design. Fig. shows the straight draft.



Skip draft

The skip draft is suitable for weaving fabrics having heavy warp thread density. In this kind of draft plan, the number of heald frames may be twice or more than the minimum required for a weave. The purpose of using more heald frames than the minimum recommended is only to distribute the warp threads more uniformly so as to prevent abrasion of the threads due to overcrowding. (Fig.)



The heald frames are divided into two groups. All even numbered warp threads are drawn through the first group of heald frames and all odd numbered warp ends are drawn through the second group of heald frames.

The sateen draft serves the same purpose as the skip draft. A skip draft is normally employed for weaves such as plain and twill up to a repeat of 4. Whereas the sateen draft is used for weaves having repeat size of more than 5

Pointed draft

This is similar to a straight draft. It is suitable for weaves such as pointed twill, diamond weaves and ordinary types of honeycombs. The straight draft is reversed after half the repeat warp way. The number of heald shafts is about half the repeat size of the weave. Fig. shows a pointed draft.

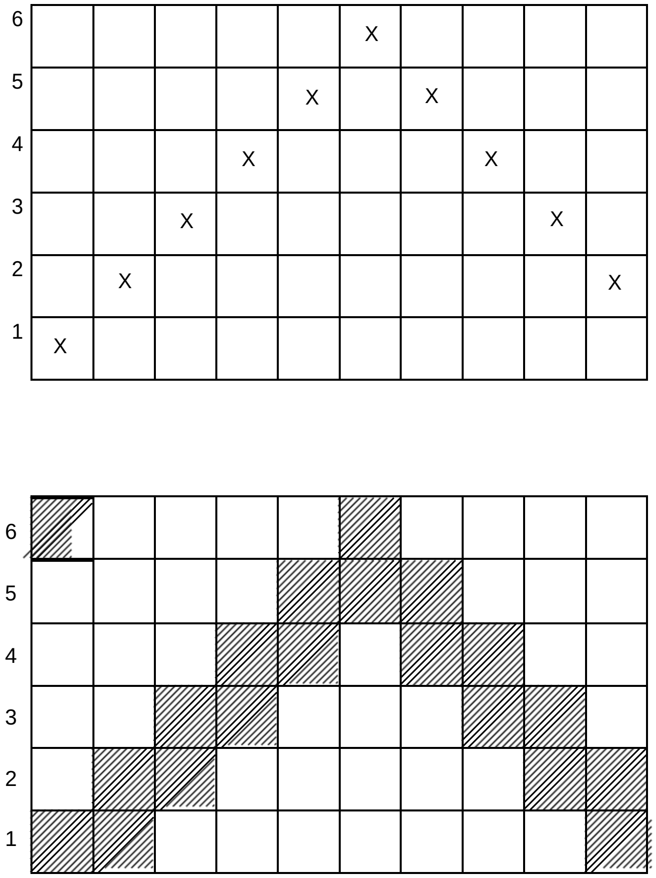
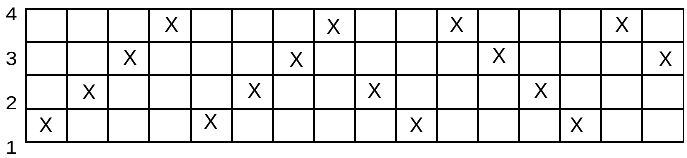


Fig. *Waved Twill and Pointed Draft*

Broken draft

A broken draft almost resembles the pointed draft. However, the pointed effect is broken. This type of draft is suitable for weaves such as herringbone twills (Fig.).



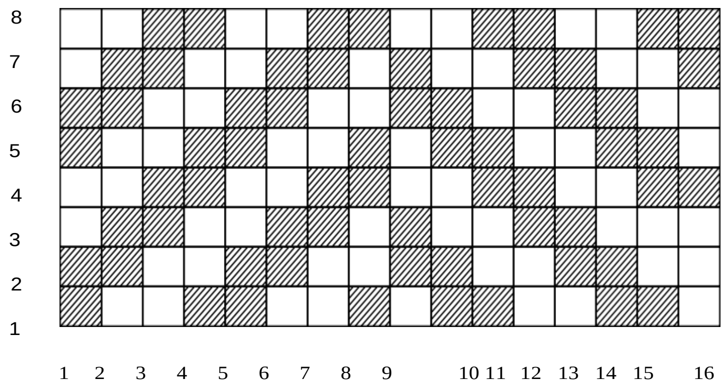


Fig. *Waved Twill and Broken Draft*

Divided draft

This draft is used for weaves having two series of warp threads such as terry, double cloth, warp backed cloth etc. As can be seen in Fig., the two sets of warp threads, say, face and back warps are divided into two groups. The first group is for 8 heald shafts and second for 9-12 heald shafts.

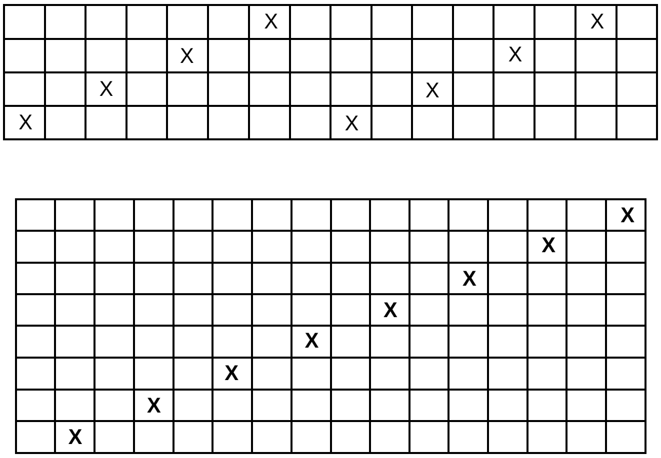


Fig. *Divided Draft*

Grouped drafts

These drafts are employed for the production of stripe and check designs, in which the stripes have different weaves or their combinations. This draft (Fig. 2.8) is used for producing the fabric with two different stripes. The repeat of the draft is determined by the number of stripes and the number of threads in each stripe. The number of shafts in the draft depends upon the number of stripes and the warp repeat of weave of each stripe.

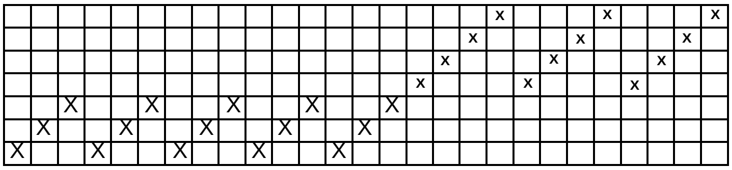


Fig. *Grouped draft repeat size 12 +15= 27 Grouped draft*

Combined draft

Various methods of drawing in can be combined in one draft for producing a certain type of fabric. Two or more drafts described above can be applied simultaneously, for example, straight and skip or sateen, grouped and curved, and so on. Combined draft is the most complicated and can be chosen only if there are some technological or economic reasons. The designer having a great experience can do it properly.

Relation between design, draft and lifting plan

The construction of any woven fabric depends upon the design, draft and the lifting plan and these are very closely dependent upon one another. A thorough knowledge of this interdependence is very valuable to the designer upon whose skill several mechanical limitations of the loom may be imposed. In many cases it is only his innate acquaintance with the drafting systems and the possibilities of manipulating the lifting orders which enables him to introduce variety into apparently rigid mechanical systems of operation. In normal practice the designer has to produce a range of designs for looms with a known pattern scope. This usually involves the draft and the lifting plan construction. A similar procedure is adopted when the designer is asked to reproduce a specific design from a sample. The weave in the sample is analysed and a suitable draft and lifting plan is derived**.**

Denting plan

Warp ends during weaving are spaced out across the width of the warp sheet according to the desired density by the wires of the reed. The most frequent order of density is one, two, three, four ends per dent. There are some types of fabrics, however, which require an irregular order of denting to emphasize certain design feature, and in such cases the order of arrangement of the ends in the reed becomes an essential part of the design and must be indicated carefully and in the correct relationship in respect of the weave and the draft. The various methods of indicating the denting are shown in Fig.

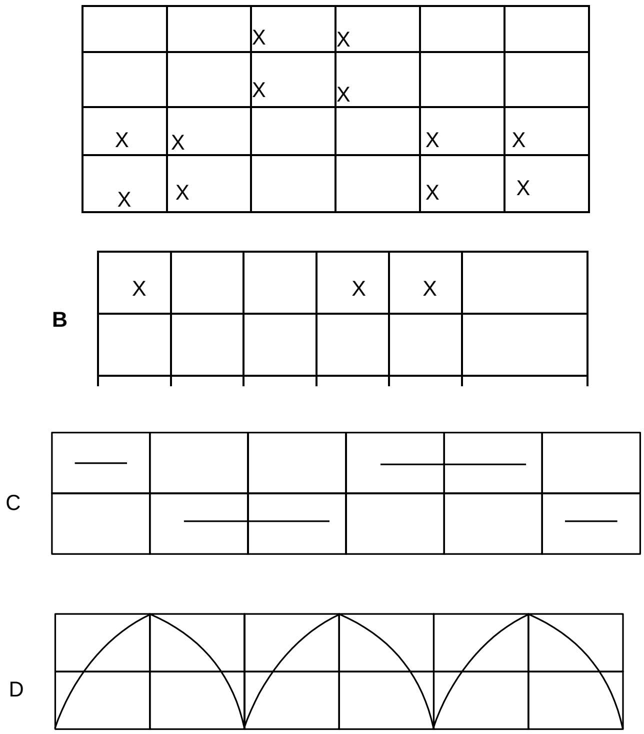


Fig. *Various Methods of representing the Denting Plans*

At A, is shown a matt weave design. The different denting plans for this design are shown at B, C, and D. However the type of denting plans shown at B is most commonly used.

Plain Weaves and its derivatives

Basic concept of Plain-woven structure.

The plain weave is variously known as "calico" or "tabby" weave. It is the simplest of all weaves having a repeat size of 2. The range of application of this weave is wide.

The plain weave has the following characteristics:

(i) It has the maximum number of binding points
(ii) The threads interlace on alternate order of 1 up and 1 down.
(iii) The thread density is limited
(iv) Cloth thickness and mass per unit area are limited.
(v) It produces a relatively stronger fabric that is obtained by any other simple combination of threads, excepting that of "gauze "or "cross weaving".

The principle involved in the construction of plain cloth is the interlacement of any two continuous threads either warp or weft in an exactly contrary manner to each other, with every thread in each series passing alternately under and over consecutive threads of other series interlaces uniformly throughout the fabric. By this plan of interlacement, every thread in each series interlaces with every thread in the other series to the maximum extent, thereby producing a comparatively firm and strong texture of cloth. A complete unit of the plain weave occupies only two warp threads and two picks of weft (Fig.), which is the design for that weave.

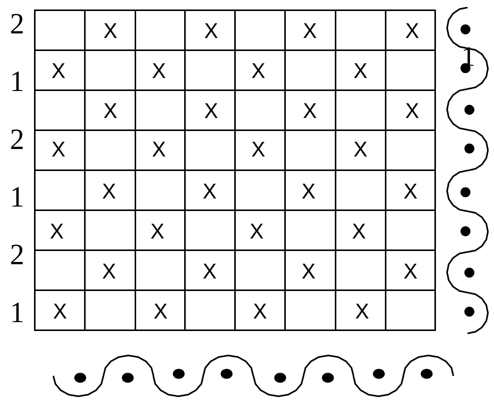


Fig. *Plain or Tabby Weave*

Textural stability of plain weave in relation to other weaves

The firmness of any woven structure depends on the frequency of interlacing between the warp and weft threads. The greater the number of intersections the better will be the firmness of the cloth. Let us consider the case of two fabrics woven with identical warp and weft counts and thread settings. Consider that one is woven as plain weave and the other with any other weave such as twill, sateen etc. It will be seen that the latter will be less firm, and therefore of weaker texture than the former, because the threads composing it would be bent in a lesser degree than those of the plain weave, thereby causing them to be less firmly compacted. Thus it is important that the counts of warp and weft, the number of warp threads and picks per inch, and the weave, should be properly proportioned, in order to obtain the best results.

Range of textures produced in plain weaves

The plain weave is produced in a variety of forms and textures, possessing totally different characteristics, which adapt it for specific purposes. A variety of forms in textures are produced :

(i) By causing a differential tension between the warp threads during weaving.
(ii) By using various counts of yarn for weaving different types of fabrics,
(iii) By using warp and weft yarns of different counts in the same fabric,

The term ‘texture’ is related to type of material, counts of yarn, relative density of threads, weight, bulk, feel during handle, and other properties. The range of textures produced in plain cloth is wide. An ideal plain cloth is one which has identical or similar warp and weft constructional parameters.

End uses

Plain weave finds extensive uses. It is used in cambric, muslin, blanket, canvas, dhothi, saree, shirting, suiting, etc.

Construction of standard plain weaves and its derivatives like Warp rib, weft rib and matt etc

The plain weave may be modified by extending it warp or weft way or both. The extension of the plain weave thus produces a rib effect. A warp rib results from extending the plain weave in the warp direction and a weft rib structure results from extending the plain weave in the weft direction. A matt rib results from extending the plain weave in both directions**.**

The chart below shows the derivatives/modifications of plain weave:

Plain weave

Warp rib Weft rib Matt rib

Regular Irregular Regular Irregular Regular

Irregular

Warp rib weaves

These are produced by extending the plain weave in warp wary direction. Fig. shows the warp rib weaves constructed on regular and irregular basis.

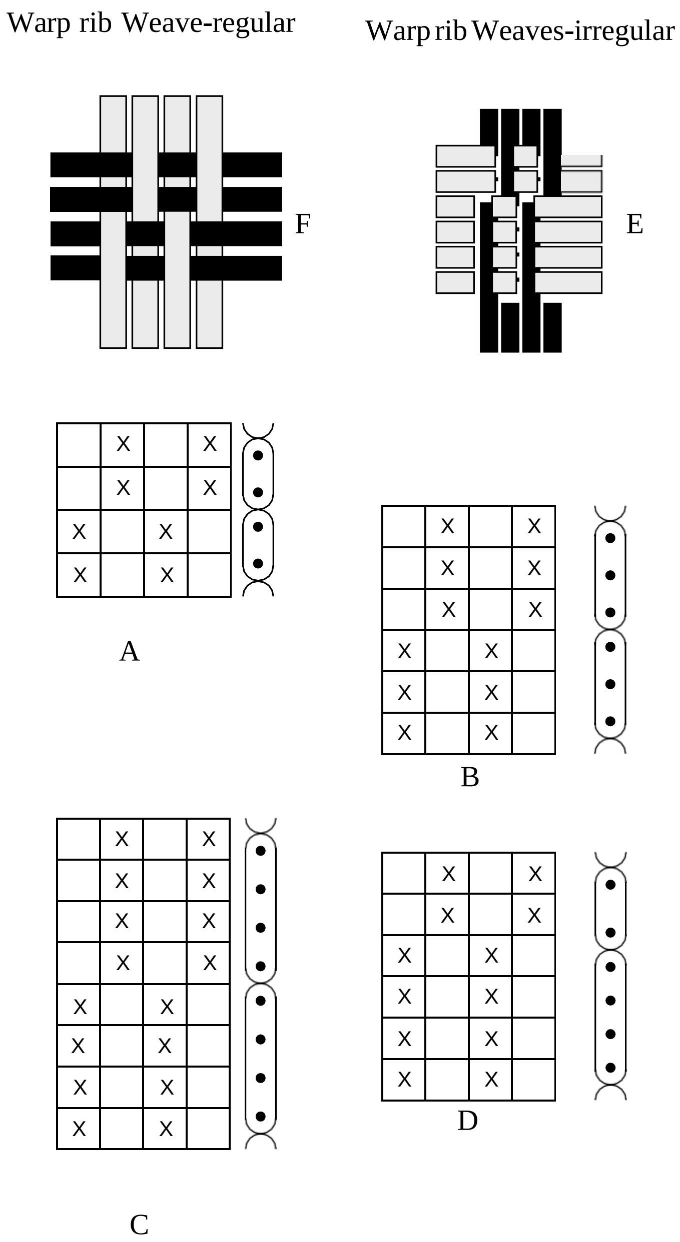


Fig. *Warp rib Weaves*

At A, B and C are seen regular warp rib weaves and at D, is shown the irregular warp rib weave. E and F show the interlacing of D and A respectively

Weft rib weaves

These are constructed by extending the plain weave in weft direction as shown in Fig. 3.3.

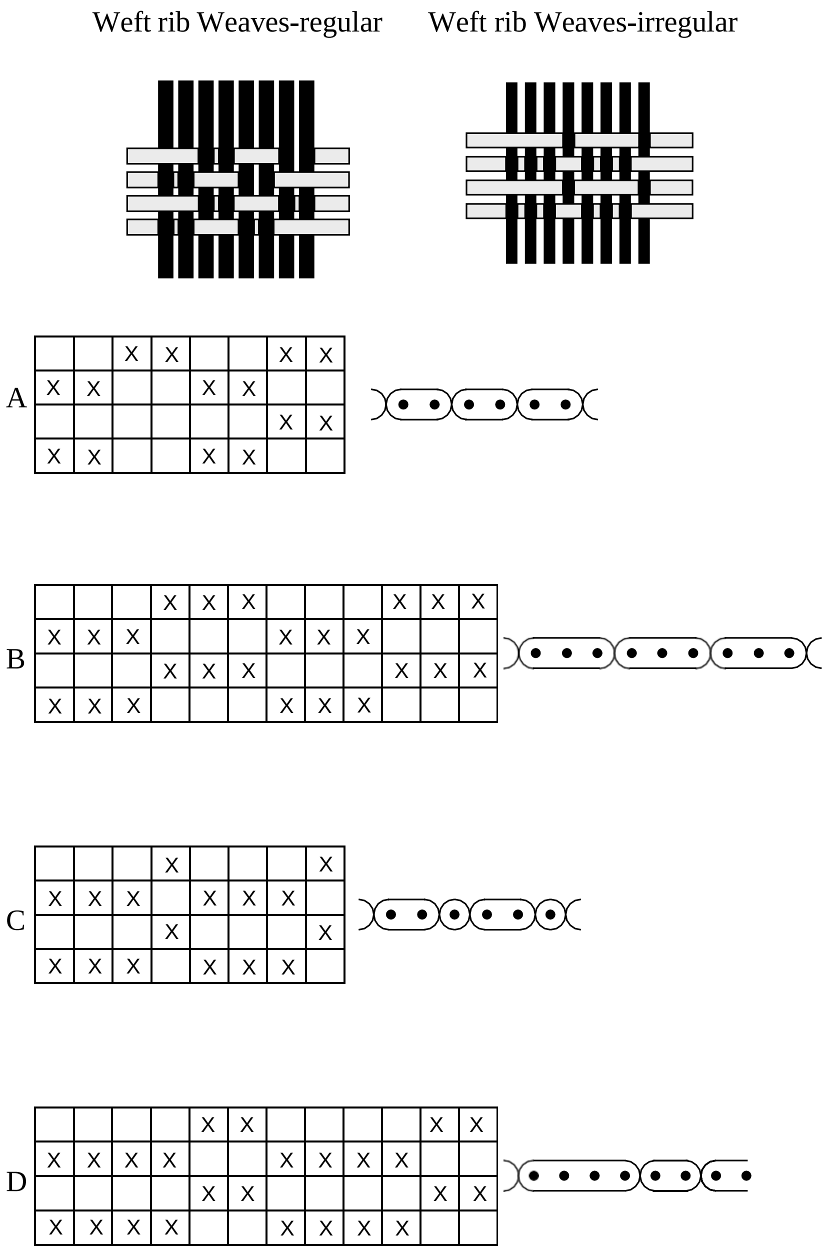


Fig. *Weft rib Weaves*

In both the warp and weft rib weaves, the appearance of the cloth depends on the respective thread settings, and to achieve good effects, it is necessary to weave a weft rib with a high number of picks per inch and a comparatively low number of ends per inch. Similarly, the warp rib effect can be enhanced with a high number of ends per inch and a comparatively low number of picks per inch. The prominence of the rib can be increased by suitable use of coarse and fine yarns. The dependence of all rib constructions upon the correct thread settings is marked.

The typical constructional particulars for a weft rib structure is given below: Warp - 2/14s & 36s
Ends/inch - 56
Weft - 18s
Picks/inch - 100

The typical constructional particulars for a warp rib structure is given below:

Warp - 30s cotton Ends/inch - 126 Weft - 15s cotton Picks/inch - 38

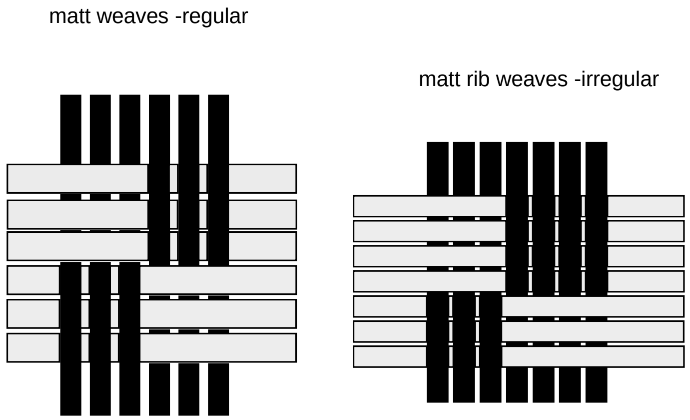
Uses

Rib weaves are used in gross grain cloths, matelasse fabrics, repp cloth which is extensively employed for window blinds in railway carriages and other vehicles, upholstering furniture, and cambric picket handkerchief.

Matt rib weaves

These weaves are also variously known as hopsack or basket weaves. The matt rib structures result from extending the plain weave in both directions.

The regular and irregular types are shown in Fig.



In case of regular matt weave, the plain weaves are extended equally in the warp and weft directions, where as in case of irregular matt weaves, the plain weave is extended unevenly or irregularly in the warp and weft directions.

Uses

Matt weave finds extensive uses for a great variety of fabrics such as dress materials, shirtings, sail cloth, duck cloth etc.

Ornamentation of plain weave

Compared with other types of woven fabrics, the structure of plain weave is the simplest. Most of the woven fabrics are made of plain weave and very tight fabric is also formed by plain weave. In plain weave, weft yarn passes through the warp alternatively.

Types of plain cloth:

Plain cloth made of plain weave is commonly seen in the market. Plain cloth is classified into:

1.Muslin

2.Linen

3.Alpaca

4.Taffeta

5.Calico

6.Long cloth

Properties of plain weave:

1.Both side of the weave are identical.

2.It improves the total output of woven fabric.

3.Plain weave is used as different kinds of textile raw materials and yarns, cotton, linen, jute, synthetic fibers, spun and continuous filament yarn, etc.

4.Thread interlacement is in alternative order.

5.The adjacent threads receive the maximum amount of support from each thread.

6.Structure of plain weave is stronger and better than any other structure.

7.Friction as well as stress on warp yarn is reduced by skip draft.

Ornamentation techniques of plain weave:

Various types of plain weave are commonly seen is the market. They have different outlook though they are made by the same design. The outlook of the plain fabric is changed by using ornamentation techniques.

1.Using extremely fine yarn, i.e. Muslim cloth.

2.Using coarse yarn, i.e. Jute Hessian.

3.Using threads of different colors which are combined in check form.

4.Using the threads on both warp and weft that may be varied in color and count.

5.Using Fancy Slub yarn.

6.Using two warp beam in different tension.

7.Using different twisted yarn.

8.Using special shaped reed.

9.Using different textile materials.

Twill Weaves and its derivatives

Basic concept of twill weaves.

Twill weaves are the weaves that find a wide range of application. They can be constructed in a variety of ways. The main feature of these weaves that distinguishes from other types is the presence of pronounced diagonal lines that run along the width of the fabric.

The basic characteristics of twill weaves are:

(i) They form diagonal lines from one selvedge to another.
(ii) More ends per unit area and picks per unit area than plain cloth.
(iii) Less binding points than plain cloth
(iv) Better cover than plain weave
(v) More cloth thickness and mass per unit area.

Classification of twill weaves

The twill weaves are produced in a wide variety of forms. They are however classified broadly into important categories, namely:

(i) Ordinary or continuous twills
(ii) Zig zag, pointed or wavy twills
(iii) Rearranged twills such as satin/sateen weaves and corkscrew weaves
(iv) Combination twills
(v) Broken twills
(vi) Figured and other related twill weaves

The above types of twills are further subclassified as:

(a) Warp face twills
(b) Weft face twills
(c) Warp and weft face twills

Continuous twills

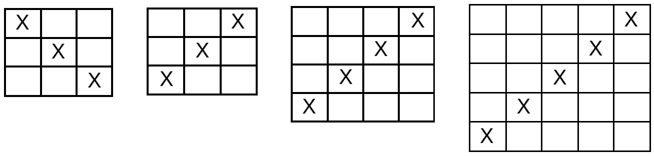
Warp faced twills

In these types of twills, the warp thread floats over all the picks in a repeat except one pick. The minimum repeat size required is 3. Examples of warp faced twills are 2/1, 3/1, 4/1, 5/1 et

Weft faced twills

These twills are the reverse of the previous ones. In these weaves the weft thread floats over the warp on all picks in a repeat except one. Examples of weft faced twills are 1/2, 1/3, 1/4, 1/5 etc.

Some types of weft faced twills are shown in Fig.



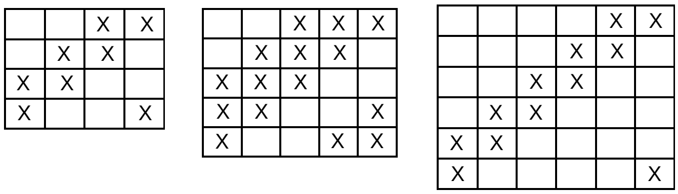
A **B** C **D**

Fig. *Weft Faced Twill*

Fig. B, C and D show a right-handed or ‘Z’ twill and Fig. A shows left-handed or ‘S’ twill.

Warp and weft faced twills

In these twills the warp and weft floats may be equal or unequal with either the warp floats predominating the weft floats and vice versa. Some examples of these twills are shown in Fig. 4.4 A, B and C respectively.



A B C

Fig. *Warp and Weft faced Twill*

Influence of twist direction and angle of twill on appearance of fabric.

The angle of twill

The angle of twill is the angle between the diagonal twill line and an imaginary horizontal line or axis parallel to the weft. This angle is dependent on the ratio between the ends/inch and picks/inch in the cloth. When the warp ends/inch is equal to the weft picks/inch, the twill angle will be 45°. When the warp ends/inch exceeds the weft picks/inch the twill angle will be an obtuse angle i.e., $>45^\circ$ (high angle or steep twill). When the weft picks/inch exceeds the warp ends/inch, the twill angle will be an acute angle i.e., $<45^\circ$ (low angle or flat twill).

Factors determining the prominence of twill weaves

The following factors determine the relative prominence of twill weaves

(i) Nature of the yarn
(ii) Nature of the weave
(iii) The warp and weft threads/inch, and
(iv) The relative direction of twill and yarn twist

Nature of the yarn

The fineness of yarn and the amount of twist given to it influence the prominence of the twill. A coarse yarn of lower twist produces a greater effect on the twill as compared to a fine yarn of higher twist. On the other hand, doubled or ply yarns have a stronger effect on the twill as compared to single yarns.

Nature of the weave

Twills with longer floats will give more prominence as compared to those with shorter floats. For example, a 3/1 twill will be more prominent as compared to a 2/2 twill. It is to be noted that an increase in float length has to be balanced by proportionately increasing the corresponding threads/inch.

Warp and weft threads/inch

The twill prominence increases proportionately with the increase in warp and weft threads/inch.

Relative direction of twill and yarn twist (twist twill interaction)

Another important factor that influences the prominence of twill is the direction of twist in the yarn. When the direction of yarn twist is same as the twill direction, the prominence is reduced and when the direction of the the yarn twist is opposite to the twill direction, the prominence of the twill is increased. In other words, a Z twill with Z twist yarn or an S twill with S twist yarn shows less prominence. On the other hand, a Z twill with S twist yarn or S twill with Z twist yarn gives more prominence.

Construction of Derivatives of Twill design – Balanced and Un balanced twill, pointed twill, combined twill (end and end, pick and pick Combination.), broken twill etc.

Balanced and unbalanced twills

In these types of twills, the warp and weft floats may be equal or unequal. In other words, the twills may be of the reversible or irreversible types. Accordingly, they may be known as balanced and unbalanced twills. Examples of balanced twills are 2/2, 3/3, 4/4, 5/5 etc. Examples of unbalanced twills are 2/3, 4/2, 5/3 etc. The 2/2 twill is popularly known as “Gaberdene” weave. Fig. A and B show designs for balanced and unbalanced twills and C and D show the interlacement diagrams of a 4/1 twill and 1/4 twill (warp faced) (weft faced).

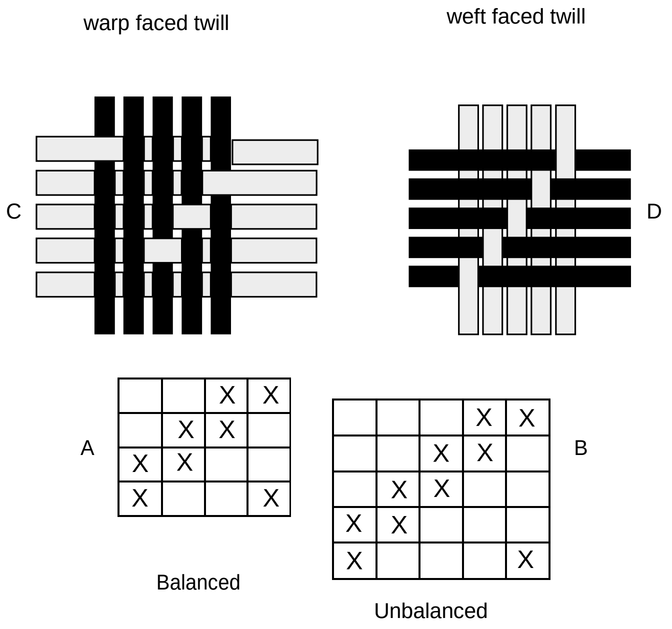


Fig. *Balanced and unbalanced Twill*

Combination twills

In these types of weaves two different types of continuous twills are combined together alternately. The combination may be warp way or weft way. Accordingly warp or weft faced twills may be used suitably. The angle of twill is influenced by the method of combination. If the twills are combined warp way, then the angle of twill is less than 45° and if the twills are combined weft way the angle of twill angle is greater than 45°.

Combination twills find extensive use in the worsted industry in the production of garment fabrics, as these weaves are capable of producing compact textures. These twills are constructed by two methods:

(i) End and end combination
(ii) Pick and pick combination.

In the first method the twill weaves are combined end way and in the second method twill weaves are combined in pick way. The designs for the different types of combination twills are shown in Figs.

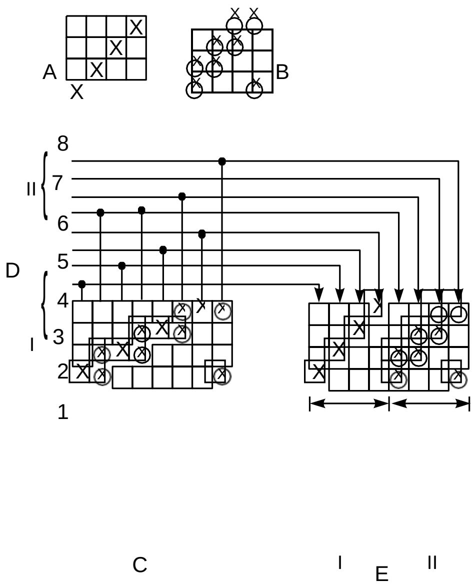


Fig. *Combined twill constructed by end combination*

Fig. A and B show the basic twill designs. In Fig. A is shown a 1/3 twill and in Fig. B is shown a 2/2 twill and in Figs. C, D and E show the design, draft and peg plan respectively.

The type of draft used here is the divided draft. The heald shafts are divided into two groups, the first group controls the first design (1/3 twill) and the second heald shaft controls the second design (2/2 twill).

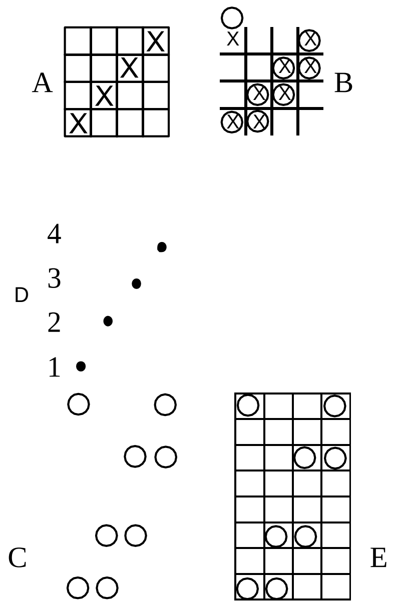


Fig. *Combined twill constructed by Pick and Pick Combination*

In Fig. is shown the design for combined twill constructed by pick and pick combination. Fig. A and B show the basic designs. The weave marked weft way. Figs. C, D and E show the design, draft and peg plan respectively. The draft used is a straight draft and hence the peg plan is same as design.

Broken Twill

These twills are constructed by breaking the continuity of any continuous twill weave. The continuity can be broken in either a regular or an irregular order. Broken twills generally give a stripe like effect. The direction of the stripes can tend to be in either the direction of warp or weft accordingly as the continuity is broken warp or weft way.

A large variety of attractive effects, generally somewhat similar in appearance to herring bone twills, can be produced by breaking a regular twill. One of the simplest methods of constructing a broken twill is shown in Fig. 4.15. The method involves skipping a suitable warp thread in a repeat of the twill.

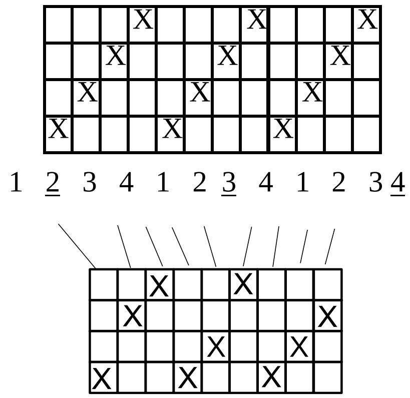


Fig. *Broken twill*

At Fig. A is shown a 1/3 twill with three repeats and the design of the broken twill is shown in Fig. B. In the method adopted above, the most suitable number to skip is one less than half the number of threads in the repeat of the twill i.e. (N/2 – 1) where N is the number of threads in the repeat of the twill. According to the above formula the number of threads to miss is 4/2 – 1 = 2 – 1 = 1. Thus, in the design, the second end is missed in first repeat, third end is missed in second repeat and fourth end is missed in third repeat. It should be remembered that no similar ends must be missed in any two or three repeats.

Construction of Diamond & Corkscrew weave

<u>Diamond twill weave</u>

Construction of Regular diamond twill weave

- Decide no. of healds to be used
- Weave area = **2 (No. of healds – 1) × 2(No. of healds – 1)**
- First, we make **Regular pointed draft**
- Second, we make peg plan
- Third, up/down shown on peg plan (left to right)
- Fourth, healdwise peg plan working shown on weave area

Construction of Regular diamond twill weave

- Decide no. of healds to be used
- Weave area = **2 (No. of healds) × 2 (No. of healds)**
- First, we make **Irregular pointed draft**
- Second, we make peg plan
- Third, up/down shown on peg plan (left to right)
- Fourth, healdwise peg plan working shown on weave area

Cork screw weaves

These are basically hard weaves and constitute another important category of rearranged twills. They are capable of producing firm and compact textures of good strength, durability and warmth. Hence these weaves are suitable in the production of garments from worsted fabrics. The two important requirements in the construction of corkscrew weaves are

(iii) The repeat size should be an odd number, and

(iv) The warp float should be one greater than weft float in case of warp faced weaves and vice versa.

Corkscrew weaves are classified as

(i) Warp faced corkscrew weaves, and

(ii) Weft faced corkscrew weaves.

The warp faced weaves are constructed by rearranging continuous twills warp way and weft faced weaves are constructed by rearranging continuous twills weft way. The base twill chosen should have odd repeat size. It should have any one thread predominating over its counterpart by one. In other words, either the warp float should exceed the weft float by one or weft float should exceed the warp float by one.

A typical weft faced corkscrew design is shown in Fig. 4.12 A and warp faced corkscrew design in Fig. B.

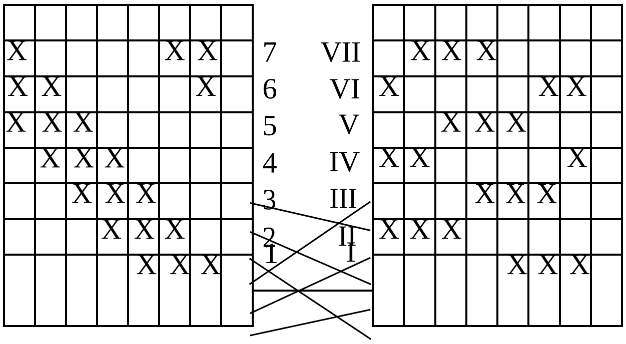


Fig. A *Construction of w eft faced corkscrew weaves*

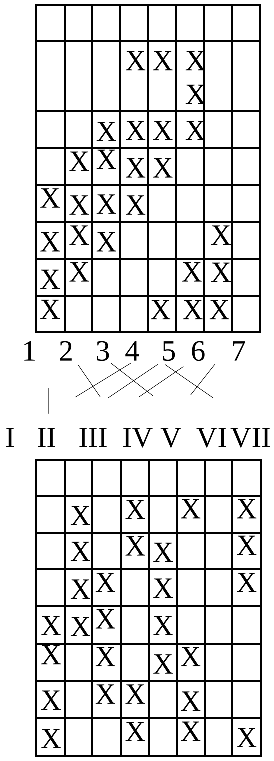


Fig. B *Construction of warp faced corkscrew w eave.*

Construction of satin & Sateen weave.

Satin and sateen weaves

Satin is a warp faced rearranged twill and sateen is a rearranged weft faced twill. Thus, **s**atin is the reverse side of sateen weaves. These weaves form an important category of weaves. They are used in combination with other weaves, particularly in case of ornamented fabrics. The striking feature of these weaves is their bright appearance and smooth feel. The basic characteristic of satin/sateen weaves are:

i. They are either warp or weft faced weaves
ii. Have no prominent weave structures
iii. Only one binding point in each end or pick
iv. No continuous twill lines
v. Have poor seam strength due to thread mobility
vi. More thread density is possible in warp and weft
vii. More mass per unit area is possible
viii. Have less binding points and more float lengths
ix. Use of move numbers (intervals of selection) is necessary to construct these weaves.

In the construction of satin/sateen weaves, the stitching points of warp or weft for a given repeat size is done by the use of move numbers or stitch or float numbers. The move numbers are selected according to the repeat size of the weave.

In choosing move numbers for the construction of satin/sateen weaves, the following rules are to be adopted:

(a) The move number should not be equal to the repeat of the weave
(b) It should not be one less than the repeat size
(c) It should not be a factor of the repeat size, and
(d) It should not be a multiple of the factor.

The designs of some satin and sateen weaves are shown in Figs.

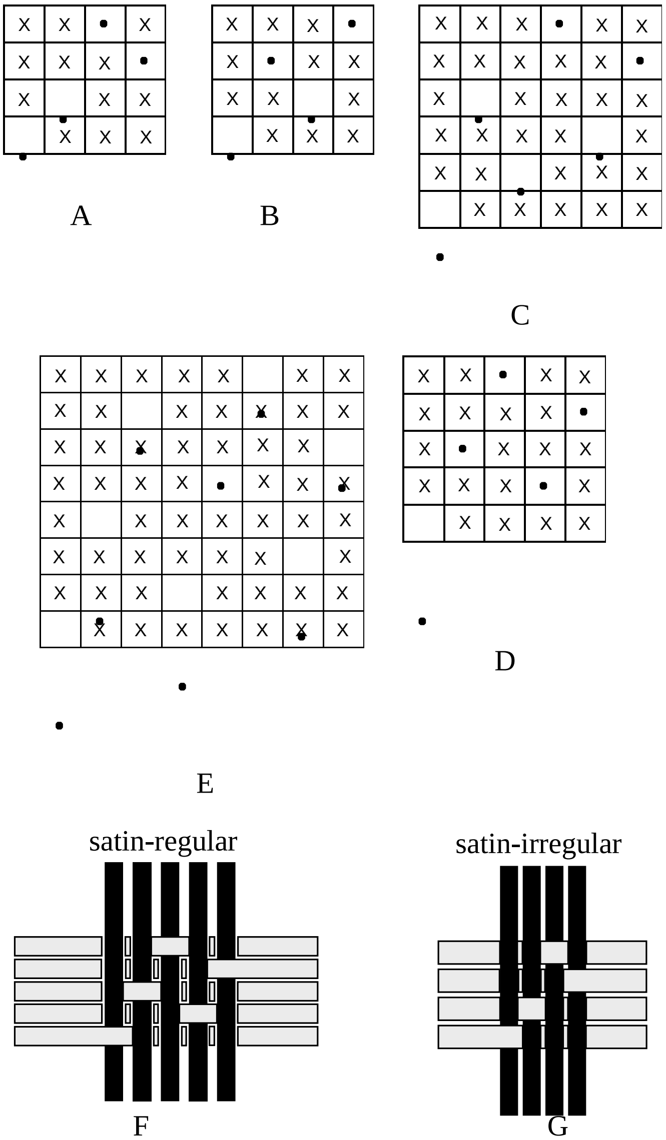


Fig. *Regular and Irregular satin weaves*

Figs. A, B and C show the different types of irregular satins and Figs. D and E show the designs of regular satin. Fig. 4.8A shows a 4-end irregular satin constructed by using a step number of 1, while Fig.B show the same satin constructed using step number of 2. Fig. D shows a 5-end regular satin constructed with a step number of 3 and Fig. E shows an 8-end regular satin constructed with a step number of 3. Fig. F and G shows the corresponding interlacing's of designs D and A respectively.

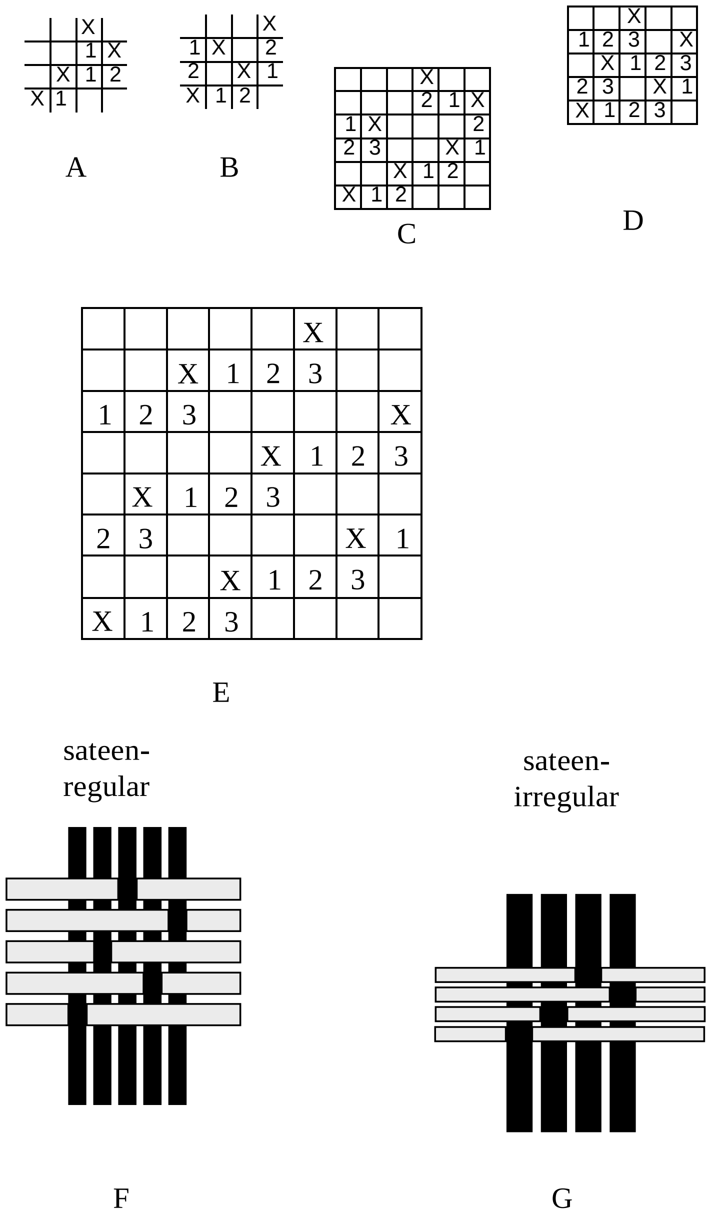


Fig. *Regular and irregular sateen weaves*

Figs. A, B and C show the design of irregular sateen weaves and Figs. D and E show regular sateen design. Fig. A shows a 4-end irregular sateen constructed with the step number of 1 and Fig. B shows the same design using the step number 2. Fig. C shows a 6-end irregular sateen. Fig. D and E show the designs of a regular 5 end and 8 end sateen constructed with step number of **1.** Fig. F and G show the interlacing's of design D and A respectively.

The following table shows the intervals of selection for the construction of satin weaves on five, and seven to twenty two threads. Instead of the numbers given, their reciprocals may be taken. Where two intervals are given, each of these or their reciprocals will produce similar results. Where more than two intervals are given, the number of numbers shown in heavy type (or their reciprocals) will give the most perfect distribution of intersections**.**

Table showing suitable move numbers for the construction of satin weaves

Type of satin	*Suitable move number*
5 end	2
7 end	2,3
8 end	3
9 end	2,4
10 end	3
11 end	2,3,4,5
12 end	5
13 end	2,3,4,5,6
14 end	3,5
15 end	2,4,7

End uses of satin-sateen weaves

Satin weaves find a wide range of application such as denim, interlining cloth, ribbons, dress materials (lustrous), children's dress materials etc.

End uses of twill weaves

Twill weaves find a wide range of application such as drill cloth, khakhi uniforms, denim cloth, blankets, shirtings, hangings and soft furnishings.

Simple Toweling & Curtain Fabrics

Construction of ordinary honey comb, Brighton, Huck-a-Back, Mock leno with draft and peg plan:

Honeycomb Weaves

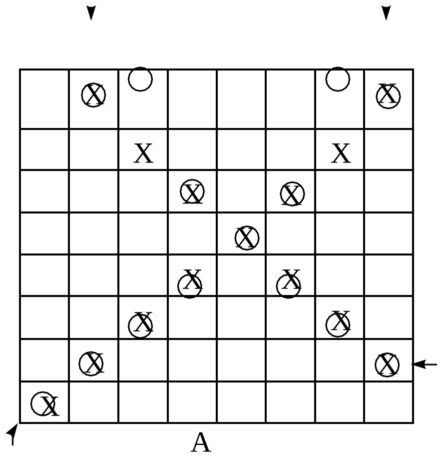
The honey comb weaves derive their name from their partial resemblance to the hexagonal honey comb cells of wax in which bees store their honey. These weaves form ridges and hollows which give a cell like appearance to the textures. Both warp and weft threads float somewhat on both sides, which coupled with the rough structure, renders this class of fabric readily absorbent of moisture. The weaves are of two classes, namely,

(i) Ordinary honey comb or honey comb proper
(ii) Brighton honey comb.

Ordinary honey comb weaves

These weaves are characterized by the following features

(a) Cell like appearance with ridges and hollows
(b) Single line crossing a single line or double line crossing a double diagonal line
(c) More warp and weft floats
(d) Moisture absorbent due to floats
(e) Constructed with pointed drafts
(f) A reversible fabric having similar effect on both sides.



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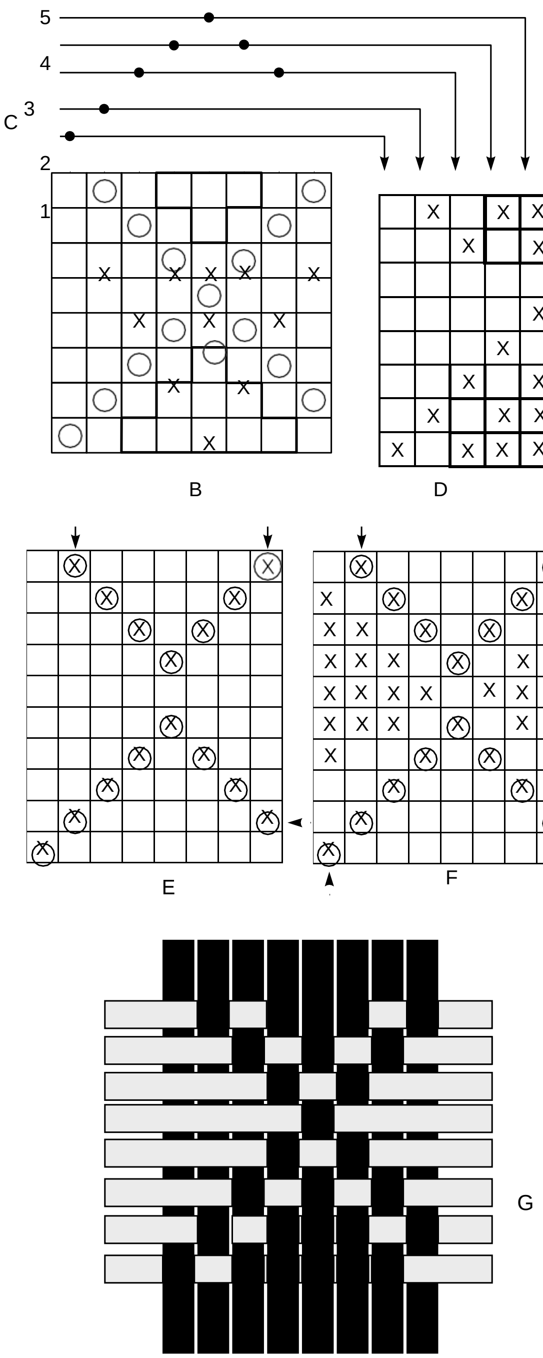


Fig. *Ordinary Honey Comb*

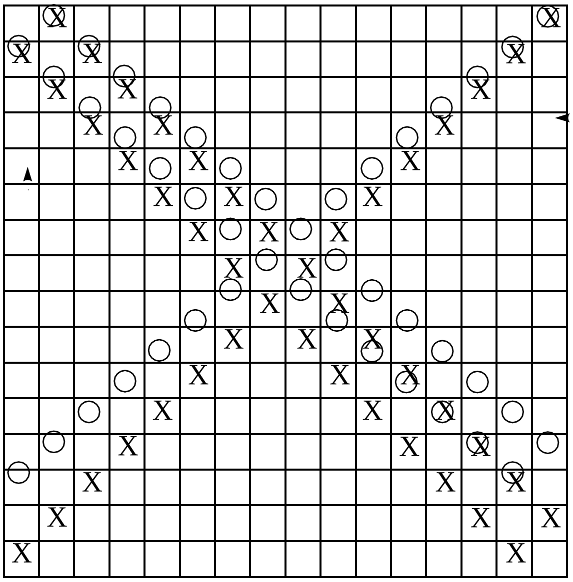
Fig. A to F, show the design of an ordinary honey comb weave. Fig. A shows the first step of constructing the design (single diagonal line). Fig. 5.1 B, C and D show the design, draft and peg plan or ordinary honey comb weave constructed on equal ends and picks. A pointed draft is used here. Fig. E shows the first step in the construction of the honey comb weave on unequal ends and picks. Fig. F shows the final design developed by incorporating a floating motif. Fig. G shows the interlacement of design B.

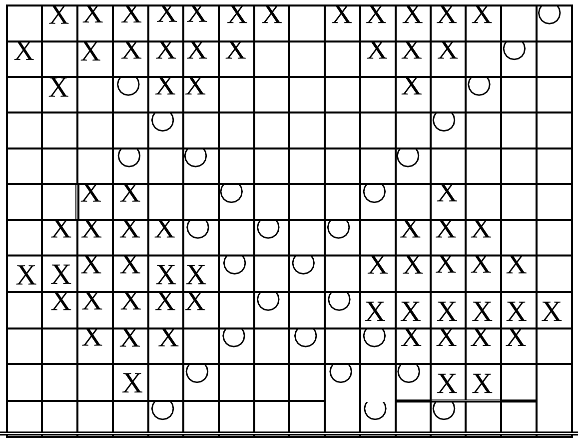
Brighton honey comb weaves

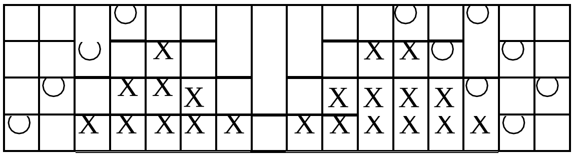
These weaves are characterized by the following features:

(a) Non-reversible cloths in which face appears different from back side of the cloth
(b) Constructed on straight drafts only
(c) Repeat size is a multiple of 4
(d) Length of longest float is N/2 – 1, where N is the repeat size
(e) A single diagonal line crosses a double diagonal line
(f) Formation of 4 cells per repeat i.e., two large and two small cells (ordinary honey comb forms only one cell per repeat)
(g) The number of threads in a repeat must be a multiple of 4.

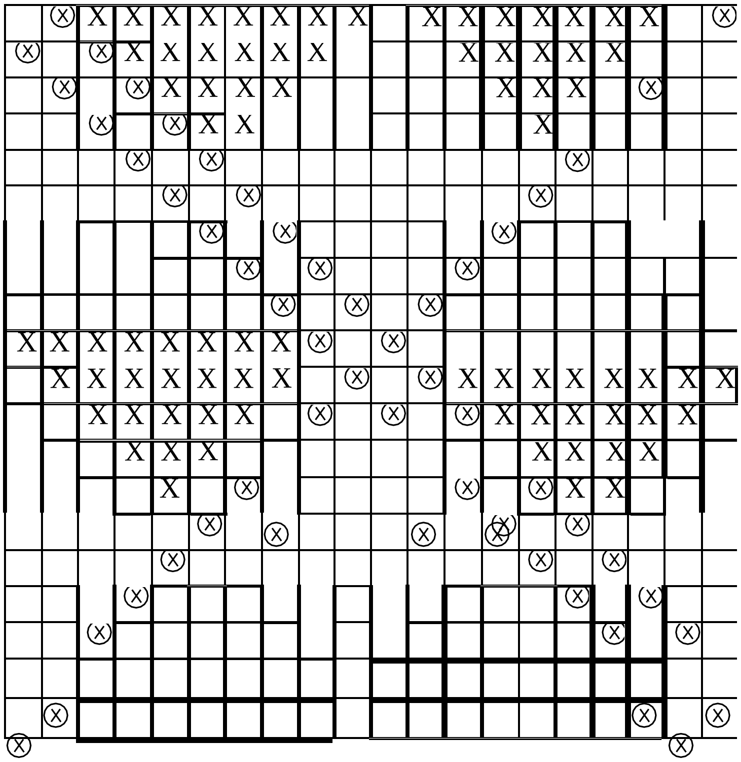
Fig. shows the construction of a Brighton honey comb weave.







B



C

Fig. *Brighton Honey Comb Weaves*

In the construction of Brighton honey comb weaves, a diamond base is first made by insertion of a single diagonal and then a double diagonal to cross it. Suitable motifs as shown in figure above are inserted inside the spaces of the diagonals. It is to be remembered that the length of the longest float in the motif should not exceed (N/2 – 1), where N is the size of the repeat of the weave. Figs. B and C show brighten honeycomb designs constructed on repeat sizes of 16 & 20 respectively.

End uses of honey comb weaves

The fabrics constructed from honey comb weaves have more thread floats on both sides and have a rough structure. This renders more absorption of moisture.

The weaves are, therefore, suitable for towels and also in various forms for bed covers and quilts.

Huck A BackWeaves

The huck a back weaves are basically toweling fabrics. They are generally associated with honey comb fabrics and hence known as honeycomb effects. They are constructed by alternately combining a floating with a plain weave. Interestingly, a number of weaves are derived from these weaves. Huck a back weave are suitable for producing thick and heavy textures. One of the well-known heavier varieties of this class is the “Grecians”. The design of huck a back weaves permits stripe and check effects to be brought out in the fabrics.

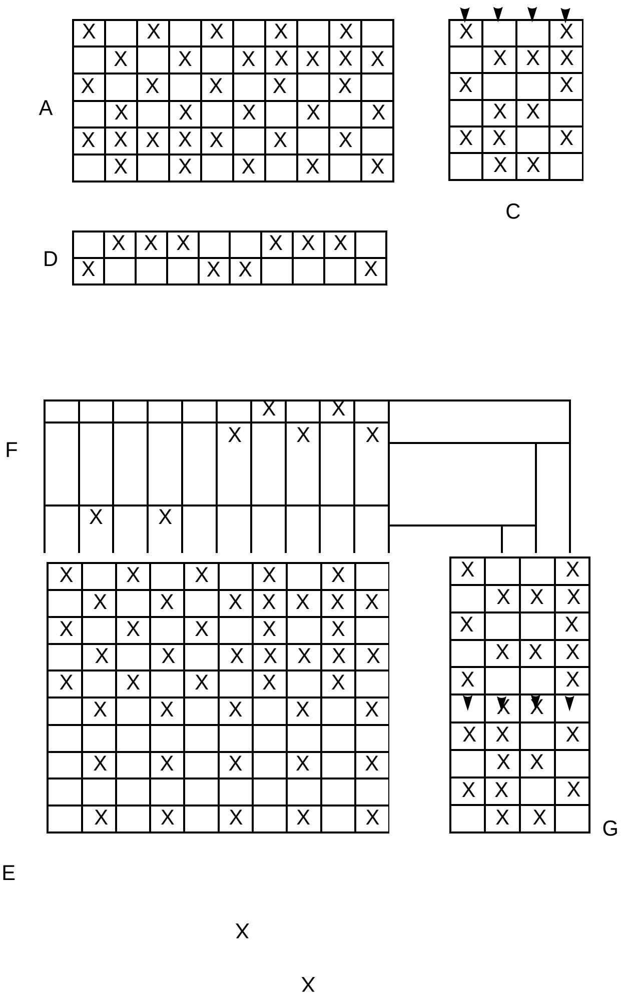
The huck a back weaves are generally characterized by the following features:

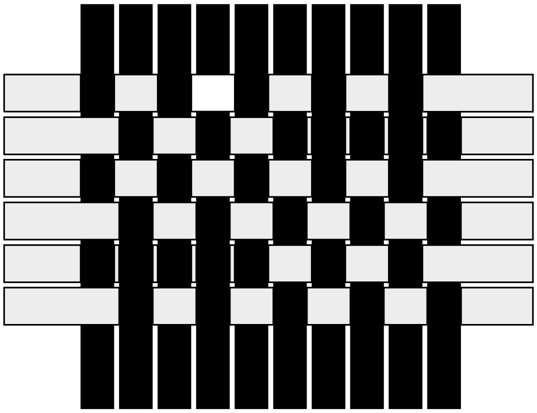
(a) Repeat is divided into four equal parts. Two parts are filled with plain weave and remaining two parts are filled with long float motif.

(b) Plain weave gives firmness to the cloth.

(c) Long float motif gives moisture absorbency.

The loom equipment required would ideally be a dobby loom fitted with a fast reed mechanism.





H

Fig. *Design of Huck-A-Back Weave*

The standard types of huck a back weaves are shown in Figs. A and E. Fig. A shows the design of a "Devon" huck a back on 6 picks, which is used for lower grade of cloths and figure E shows the design of another type of huck a back suitable for finer qualities of cloths. Figure H shows the interlacement of design A.

End uses of huck a back weaves

Huck a back weaves are largely employed in the manufacture of both linen and cotton towels for bath rooms, and also linen towels for use as glass cloths.

Mock Leno Weaves

Mock lenos, also known as imitation lenos are a variety of weaves of ordinary construction which produce effects that are similar in appearance to the gauze or leno styles obtained with the aid of doup mounting. These weaves are generally produced in combination with a plain, twill, satin or other simple weaves or even with brocade figuring, to produce striped fabrics, which bear a very close resemblance to true leno fabrics. Two kinds of structures are produced by the weaves,

(i) Perforated fabrics which imitate open gauze effects
(ii) Distorted thread effects which imitate spider or net leno styles.

Perforated fabrics

These are constructed by reversing a small unit of the weave. The weaves are in sections and tend to oppose each other. The outer threads of adjacent sections tend to be forced apart. The manner of interweaving in each section permits the threads to readily approach each other. Fig. shows the various types of perforated fabric designs.

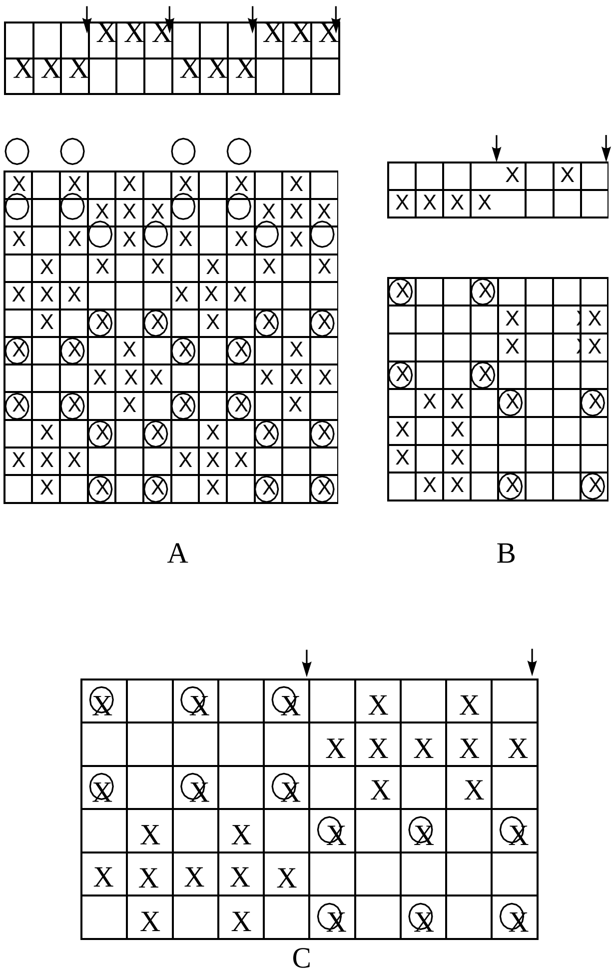


Fig. *Design of perforated fabric*

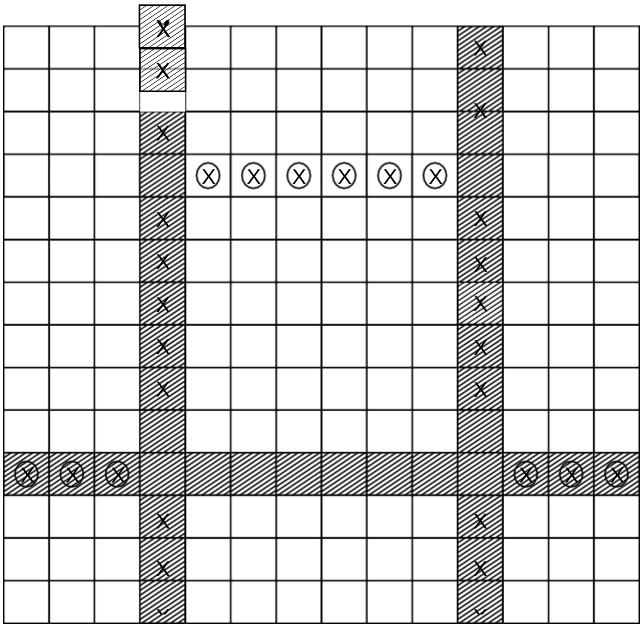
Figures A, B and C show the 3/ 3, 4/4 and 3/5 imitation gauzes. The warp threads run in groups with a space between, and are crossed by weft threads which are grouped together in similar manner.

The designs A, B and C are dented 3, 4 and 5 ends respectively per split as shown above the plans.

The arrows above the denting plans indicate the positions of the empty splits.

Distorted thread effects

The weaves of this category are so arranged to distort certain threads in either the weft or the warp, or in both weft and warp. The distorted thread effects are shown in Figs. 10.2 and 10.3.



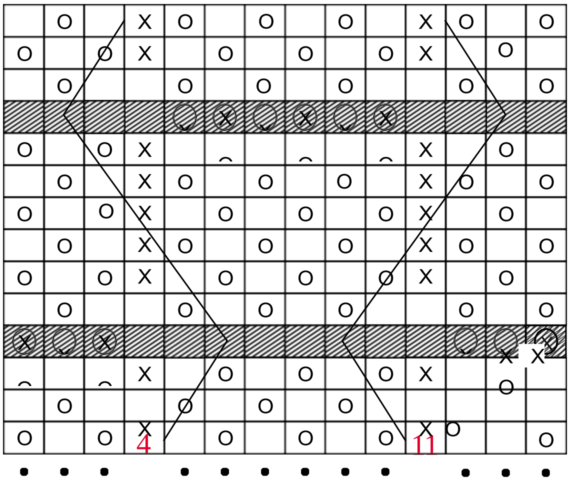
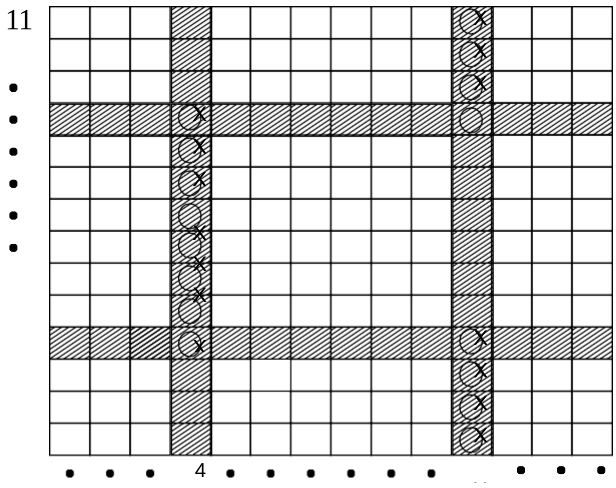


Fig. *Design of warp way distorted mock leno weave*



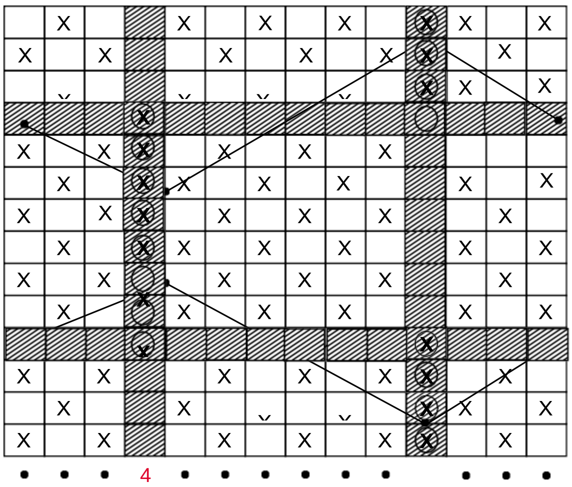


Fig. *Design of w eft w ay distorted mock leno w eave*

In Fig. the ground structure is plain weave, and the fourth and eleventh ends, which are distorted, float over all the plain picks, but pass under the fourth and eleventh picks. The latter float over one group of plain ends, and under the next group in alternate order. The distorted ends are placed on a separate beam and are given in more rapidly than the ground ends and hence they are drawn towards each other where the picks four and eleven, float over the ground ends. As the latter floats occur in alternate order, the ends are drawn together in pairs, and then separated, as indicated by the zig zag lines.

The distorted warp effects are chiefly used in combination with other weaves in stripe form. When used in stripe form the ends which form the zig zag effect should be somewhat crowded in the reed.

Figure shows a distorted weft design. The design is arranged with plain ground similar to that in fig. The floating ends pass over all the distorted picks, and alternately over the ground picks between. Therefore, the distorted picks, which float over all the ground ends, are alternately drawn together and separated, as shown by the zig zag lines of Fig.

End uses of mock lenos

Mock lenos find uses in canvas cloths, cheap fabrics for window curtains, light dress fabrics, blouses, aprons etc. In many cases, they are generally employed in combination with other weaves.

Compound structures

Construction of Bedford cords (Plain & twill faced with wadding effect) & welts design

The bed ford cords are a class of weaves that produce longitudinal warp lines in the cloth with fine sunken lines in between. They are constructed on a pair of picks or alternate picks. The cord weave is alternated by plain weave weft way. The cord effects so produced enable to bring out stripe effects in solid colours. Generally, cotton and worsted yarns are used in the production of bed ford cords. Cotton is used in weaving of lighter textures while worsted is used in weaving of heavier textures. In the design of bed ford cords, two series of warp threads are considered. The first group constitutes the face threads which weave as cord and plain weave on alternate or pair of picks. The other group of threads known as cutting ends weave as plain. The cutting ends separate the neighboring cords. The cords may be alternated by plain or twill weave weft way.

Sometimes special threads known as wadding threads are introduced in between the normal warp threads. The purpose of this is to increase the prominence of the cords and also to increase the weight, bulk and strength of the fabric. The wadding threads never interlace with weft, but lie perfectly straight between the ridges of their respective cords and the floating weft at the back. Generally wadding threads are of considerably coarser counts of yarn than the principal or face warp threads, and since they never interlace with weft but remain straight, their construction during weaving is nil. This condition necessitates the wadding threads being wound upon a separate warp beam, and held at greater tension than face warp threads during weaving.

Classification of bed ford cords

Bed ford cords are classified as shown below,

- Bed ford cords
  - Plain faced
    - on alternate picks
      - Wadded
    - on pair of picks
      - Wadded
  - Twill faced (only on alternate picks)
    - Twill faced wadded

Standard Quality particulars

The following constructional particulars are suitable for Bedford cords used as worsted dress fabrics.

Warp : 2/20s
Weft : 18s
Ends/inch : 92
Picks/inch : 82

The following constructional particulars are suitable for a cotton twill faced Bedford cord (London cord).

Warp : 14s
Weft : 20s
Ends/inch : 86
Picks/inch : 78

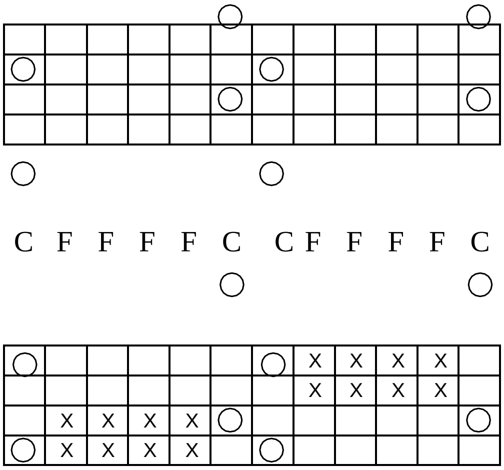
Loom equipment

A dobby loom with fast reed and heavy beat up is suitable for manufacturing bed ford cord fabrics.

Plain faced bed ford cords

In this type, the cord or rib effect is produced by alternating plain weave with the cord either on alternate picks or a pair of picks. Fig. 8.1 shows the construction of a plain face Bedford cord on a pair of picks, and Fig. 8.2 shows a Bed Ford cord constructed on alternate picks**.**

A



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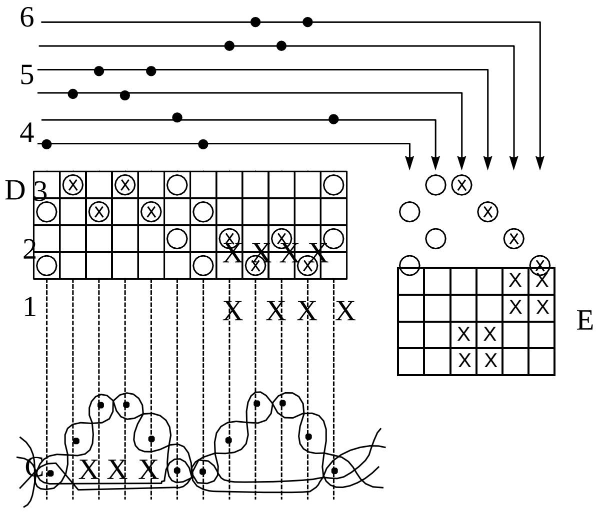


Fig. *Construction of plain faced Bedford cord on a pair of picks*

In Fig. A, is shown the repeat size of the Bedford cord. The repeat is split into cutting ends and face ends. The cutting ends weave plain and the face ends weave the cord. In Fig. A the insertion of the cutting ends are shown in the figure B, the insertion of the face ends are shown. Figs. C, D, E and F show the design, draft, peg plan and the cross section of the Bedford cord. At figure F, the interlacement of the various picks in the repeat with the face and the cutting ends are shown. In the example above the ratio of face ends to cutting ends is 2 : 4.

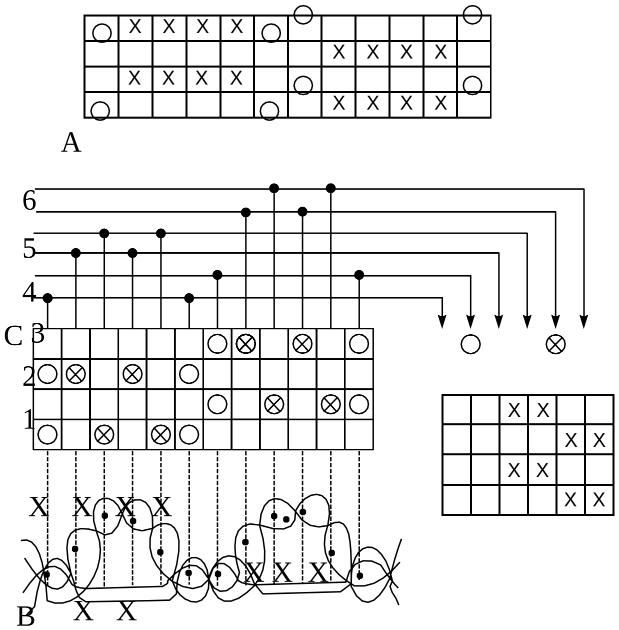


Fig. *Construction of a plain faced bedford cord on alternate picks*

Fig. shows the construction of a plain faced bed ford cord on alternate picks. Fig. A, shows the face and cutting threads. Fig. B, shows the insertion of plain weave on alternate picks to obtain the Bedford cord design.

Some wadded threads are introduced in between the face threads in order to increase the weight of the fabric or enhance the cord effect. The wadded threads so introduced will usually be coarser than the face threads and made of a cheaper material. A typical example is shown in Fig. 8.3.

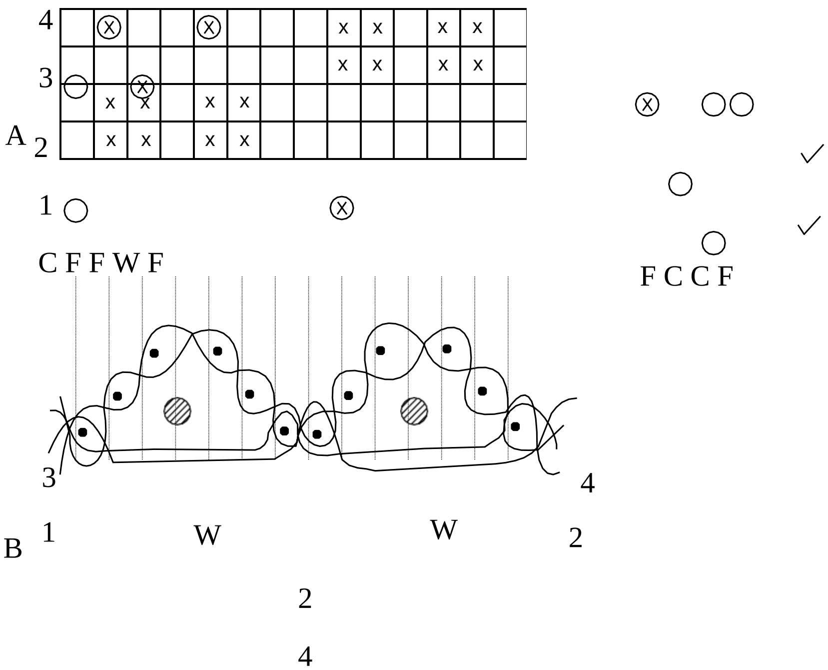


Fig. *Construction of a plain 3 faced wadded Bedford cord design*

At A, is shown the design of plain faced wadded bed ford cord. The wadded threads are introduced at the middle in between the face threads. For the purpose of differentiation, the face, cutting and wadded threads are indicated by separate notations respectively. At C is shown the warp way cross section of the design.

Twill faced bed ford cord

In this type of cord, a twill weave is used instead of a plain weave, along with the cord or rib weave to get a better effect. In this type, the warp is brought more prominently to the surface. Figure 8.4, shows the design of a twill faced bed ford cord.

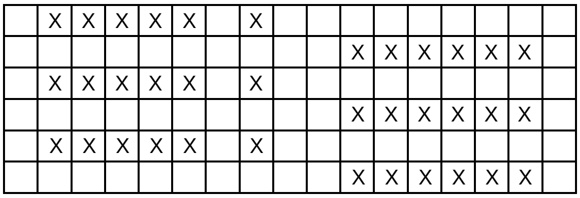


Fig. *Construction of a twill faced Bedford cord design*

At figure A is shown the twill faced Bedford cord. The twill weave is inserted on alternate picks. At B, is shown the basic twill weave, which is a 1/3 twill. The repeat size of the cord is 16/16 including the face and cutting ends.

Wadding threads can also be introduced as in the case of plain faced Bedford cords. This is shown in Fig.

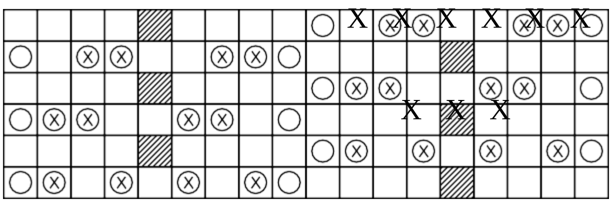


Fig. *Design of a w added twill faced Bedford cord*

At A, is shown a wadded twill faced bed ford cord design. A 2/1 twill has been chosen (figure B) and inserted with the cord. The wadding threads are inserted in between the face threads and work with the cord threads. The wadded threads do not inter weave with the picks.

End uses of bed ford cords

Bed ford cords find a wide range of applications such as dress materials, military dresses, suitings, woolen and worsted fabrics (heavy type).

Welts design

Welts and piques are characterized by more or less pronounced ridges and furrows producing a series of ribs, welts or cords with a surface tissue of the plain calico weave, and extending in parallel lines transversely across the width of the fabric, i.e., in the direction of the weft threads. A pique structure consists of a plain face fabric composed of one series of warp and one series of weft threads, and a series of back or stitching warp threads. The stitching ends are placed on a separate beam which is heavily weighted to provide greater tension to the stitching warp.

The loom equipment necessary for manufacturing pique structures are a dobby loom with two warp beams (one for face warp under normal tension and another for stitching warp under heavier tension), a fast reed beat up mechanism and drop boxes (2 ¥ 1 or 2 ¥ 2), for wadded designs.

The tight stitching ends are interwoven into the plain face texture, with the result that the latter is pulled down and an indentation is formed on the surface. In order to increase the prominence of the unstitched portions of the cloth, wadding picks are normally inserted between the tight back stitching ends and the slack face fabric.

Pique fabrics are mainly manufactured entirely of cotton woven in the grey or natural state and then bleached. They are produced in a variety of different textures, according to the purpose for which they are intended.

Standard quality particulars

Face warp: 30s - 60s
Stitching warp: 20s - 2/30s
Weft: 40s - 70s
Ends/inch: 92 - 132
Picks/inch: 96 - 152

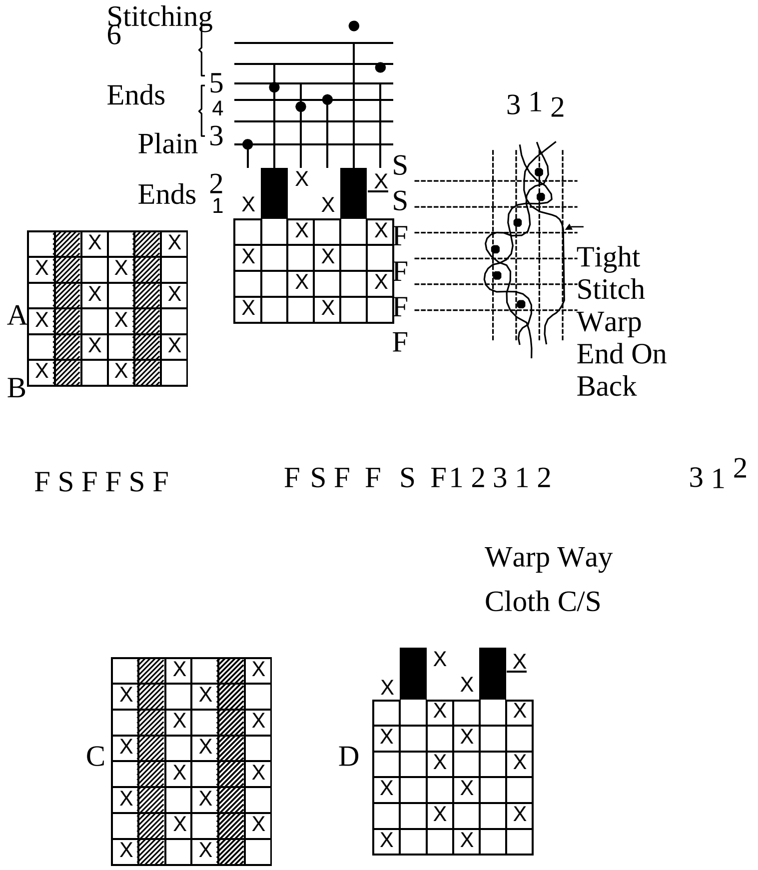
Classification of welt structures

Welt structures are classified as shown below:

- Welts
  - Ordinary welts
  - Weft wadded welts
    - Loose back welt
    - Fast back welt

Ordinary welt structures

In these types of welt structures the indentations form continuous sunken lines which run horizontally in the cloth. The number of face picks in the width of a cord is varied according to requirements, but usually the number of consecutive picks that are unstitched should not exceed twelve. Figure 9.1 shows the design of ordinary welt structures.



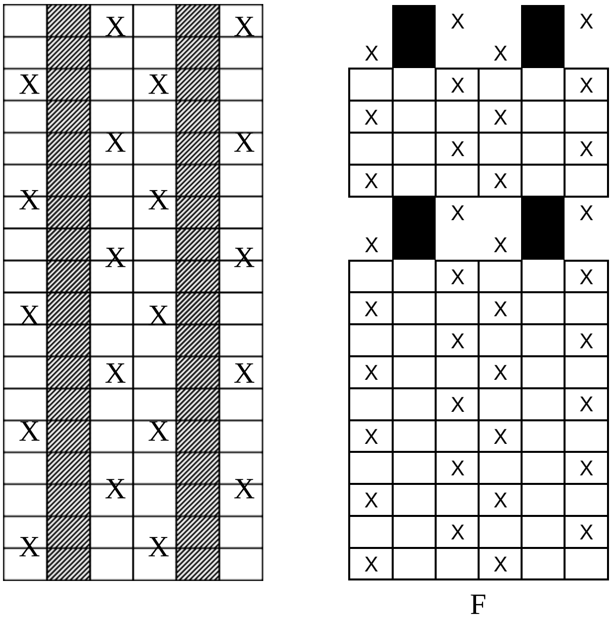


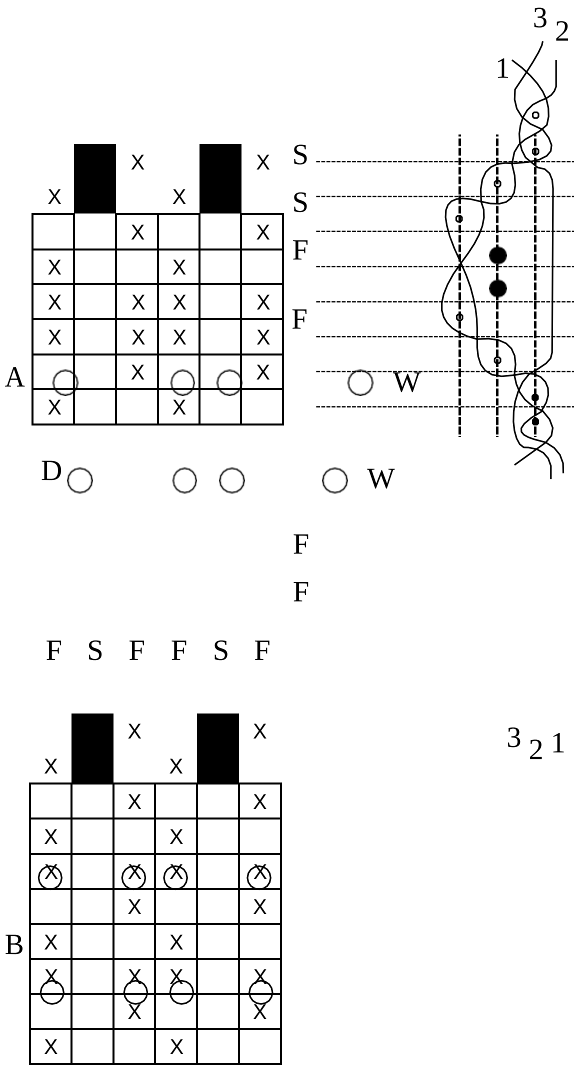
Fig. *Design of ordinary welt structure*

In the above figure, is shown some ordinary welt structures. Figs. A, C and E show the first stage in the construction of ordinary welt structures and Figs. 9.1 B, D and F show the corresponding final designs. The three different welt designs shown above are constructed on repeats of 6, 8 and 18 picks respectively. The ratio of the face to stitching warp is 2: 1. The stitching ends are indicated by shaded squares. The ends are arranged in the order of one face, one stitching and one face, in each split of the reed. In the final designs B, D and F, the solid marks indicate the lifts of the tight stitching ends into the plain face texture on two consecutive picks.

Weft wadded welts

In the case of welt structures wadding threads can be introduced weft way. The object using the wadding threads is to enhance the prominence of the horizontal cords, and to make the cloth heavier. The wadding weft is coarser than the ground weft and is inserted as a pair of picks at a place. This is achieved with looms provided with multiple shuttle boxes at one side only. The face ends are lifted over the wadding picks, while the stitching ends are left down. Sometimes, the same kind of weft is used for both the face and the wadding. In such cases looms with a single box at each side are employed, and in such cases, one wadding pick at a place may be inserted.

Wadding picks are inserted only as extra picks and the take up motion is either rendered inoperative on wadding picks, or it is worked out in terms of the face picks only. Fig. 9.2 shows the various designs of weft wadded welt structure.



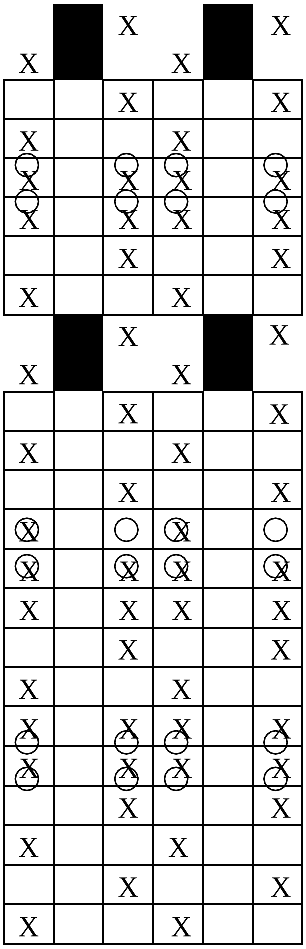


Fig. *Design of weft wadded welt structure*

Fig. A, B and C show the design of weft wadded welts repeating on 8, 10 and 24 picks respectively. The stitching warp is indicated by the solid shade, the wadded thread by circled cross mark and the plain threads by cross mark. As can be seen from the designs, the stitching takes place on three picks. Figure D shows the weft way cross-sectional view of design A.

Fast back welts

In these types of structures, the stitching's are interwoven in plain order with all, or some wadding picks. Whereas in 'loose back' type of structures (previous two types) the stitching ends are only lifted to form the indentations. In case of fast back welts, the reduction of the float length of the stitching ends on the back of the fabric helps to produce a more serviceable cloth less liable to accidental damage. Fig. shows the design of a fast back welt structure.

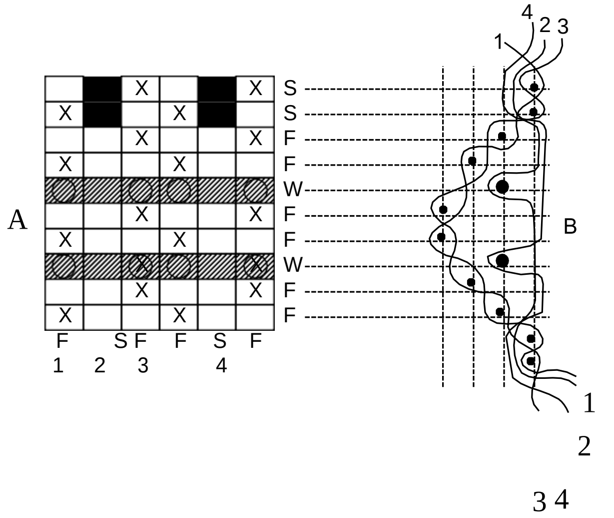


Fig. *Design of fa s t back w added welt structure*

Figure A shows the design of a fast-wadded welt structure and figure B, shows the weft welt cross-section. The numbered threads represent the face and stitching warp.

End uses of welts

Welts find uses in shirting's, ties and vesting's.

Construction of Extra warp and Extra weft designs with drafting & lifting.

In certain classes of fabrics, the ornamentation or figuring is done by using extra threads which are made to interlace with the ground fabric at intervals. The extra threads may be introduced in the warp or weft way direction or both. The notable feature of these fabrics is that the withdrawal of the extra threads from the cloth leaves a complete ground structure under the figure. The introduction of the extra threads does not affect the strength or durability of the cloth. However, the extra threads are liable to come out due to repeated use. In the case of ordinary fabrics where the figuring is formed by the ground threads the removal of any figuring thread does affect the strength and durability of the cloth. Extra thread figured fabrics, particularly extra weft figured ones, can produce attractive designs in bright and contrasting colours.

Fig. shows the simple cross section of an extra thread fabric.

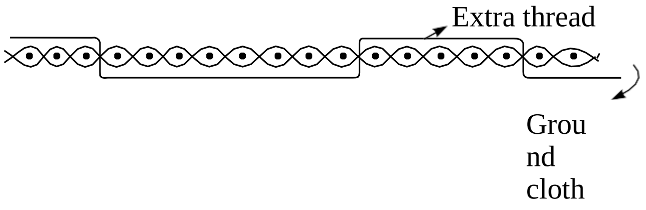


Fig. *Cross-section of Extra Thread Fabric*

Methods of production

The extra thread figured fabrics may be produced by the following methods:

(a) By introduction of a separate set of warp threads in addition to the ground warp threads.
(b) By introduction of separate set of weft threads in addition to the ground weft threads, and
(c) By introduction of both separate warp and weft threads in addition to the ground warp and weft threads.

The production of extra warp figured fabrics requires a separate warp beam, in addition to the beam required for the ground warp threads. Also the take up rates for the two beams will be different. For producing extra weft figured fabrics, ideally the loom should be fitted with a multiple box mechanism such as a 4 /1, 4 /2 or a 4 /4, depending on the weft colour requirement. Generally, a suitable ratio ofground to figuring threads is selected. The ratio may be 1:1, 1:2, 2:1 or 2:2 etc., depending on the solidity or prominence of the figure required.

Loom equipment necessary for manufacturing extra thread figured fabrics

For manufacturing extra warp fabrics, the following loom equipment's are necessary

(d) Dobby mechanism
(e) Two warp beams; one for ground warp and the other for the figuring warp

For manufacturing extra weft fabrics the following loom equipment's are necessary

(a) Dobby mechanism
(b) Drop box for ground and figuring weft
(c) Single warp beam - ground warp.

Methods of removal of surplus figuring threads

It becomes necessary to remove the extra figuring threads at portions where they are not required. The following methods are suitable for the removal of the threads:

(f) In closely constructed figured fabrics the extra threads are allowed to float loosely on the back- side of the ground cloth.
(g) In lightly constructed ground fabrics, the extra threads are allowed to float loosely on the back and are afterwards cut away.
(h) The extra threads are bound in on below the face side of the cloth by means of special stitching threads or by corresponding floats in the ground structure. This method is suitable for closely set fabrics.
(i) In some cases, the extra threads are woven as small figures with the ground at places where the regular figure is not desired.

Figuring with extra warp threads

In these fabrics the design is formed by allowing the extra warp threads to float on a ground structure. The main advantage of using extra warp in figuring is that it gives higher productivity. Extra warp method is mostly utilized for continuous styles arranged one of ground, one of extra thread warp way. Jacquard designs in this method are less popular due to the fact that each different design frequently requires the harness to be retied or otherwise modified which is costly in itself and which often leads to further costs by increasing the length of the weaving machine down time. Additional costs are incurred by the need to draw in new warps into the newly retied harness which is more expensive than knotting in. By using inferior quality materials for the figuring threads the higher cost of production can be compromised. Figuring with extra warps can be done with one, two or more colours.

Extra warp figuring with single colour

Simple effects can be produced by using a single colour extra warp. An example is given in Fig.

			X	X			
		X	X	X	X		
	X	X	X	X	X	X	
X	X	X	X	X	X	X	X
X	X	X			X	X	X
X	X					X	X
X	X	X	X	X	X	X	X
	X	X	X	X	X	X	
		X	X	X	X		
			X	X			

A

	O
O	

G1 G2
B

F1 F2 F3 F4 F5 F6 F7 F8

			O			X	O	X			O				O
	O			X	O	X		X	O	X			O		
		X	O	X		X	O	X		X	O	X			O
X	O	X		X	O	X		X	O	X		X	O	X	
X		X	O	X			O			X	O	X		X	O
X	O	X			O				O			X	O	X	
X		X	O	X		X	O	X		X	O	X		X	O
	O	X		X	O	X		X	O	X		X	O		
			O	X		X	O	X		X	O				O
	O				O	X			X	O			O		

F1 G F1 G F3 G F4 G F5 G F6 G F7 G F8 G

Fig. *Design of Extra Warp Fabric with single colour*

In the figure above, A is the motif design of the extra warp threads. B shows the ground weave, which is plain. Other weaves can also be used for the ground. The repeat size of the extra figure chosen above is 8 /10; the ratio of ground to figuring threads is 1:1. Thus the repeat size of the final design is 16/10.

Other ratios can be chosen for the ground and figuring ends, such as 1:2, 2:2 etc.

In the ground of ordinary extra warp figured fabrics, it is usually necessary for the extra threads to be invisible from the face side, and they can be floated loosely on the back, or if the ground weave is suitable, be bound in between corresponding warp floats.

Extra warp figuring with two colours

This method can be used in weaving jacquard designs to obtain a width of repeat that appears to require twice as many needles as are actually necessary, e.g., a figure repeating upon 350 extra ends will produce an effect extending over 700 extra ends. The system can also be used to produce a large repeat in dobby weaving. A typical example of an extra warp design using two colours is shown in Fig.

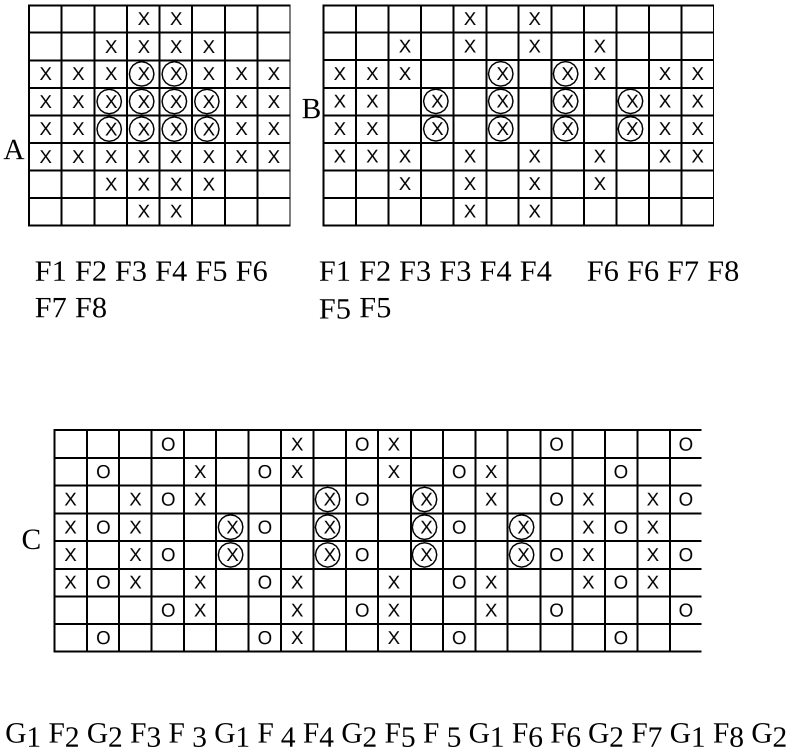


Fig. *Design of Extra Warp Fabric with two colours*

Figuring with extra weft threads

In this case the figuring or ornamentation is formed by the weft yarn. The figuring weft is introduced in addition to the ground weft. The figuring can be done using one, two or more extra weft picks in addition to the ground cloth produced by the interlacing of the warp with the ground weft in plain or in some other simple weave order. The weaving machines used for this purpose must have the capacity to insert more than one kind of weft.

The extra weft may be inserted either intermittently or continuously. In the former case the take up is of an intermittent nature, i.e. the take up operates only during insertion of the ground picks and becomes inoperative during the insertion of extra weft picks. In the latter case the take up operates continuously considering only the ground picks for the take up.

Extra weft figuring with single colour

Here only one type or colour of weft is used. The ground to figuring weft ratio is generally 1:2, 2:2, 2:4 etc. A typical design is shown in Fig.

At A, is shown the repeat size of the motif (10/8). The convention has been reversed here i.e the weft lift is indicated as ‘X’. The ratio of ground to figuring picks is 2:2. Other suitable ratios can be chosen. The ground weave is shown as a plain, though other weaves like twill, hopsack etc., can be chosen.

		X	X	X	X	X	X		
	X	X	X	X	X	X	X	X	
		X	X	X A	X	X	X		
			X	X	X	X			
			X	X	X	X			
		X	X	X	X	X	X		
	X	X	X	X	X	X	X	X	
		X	X	X	X	X	X		

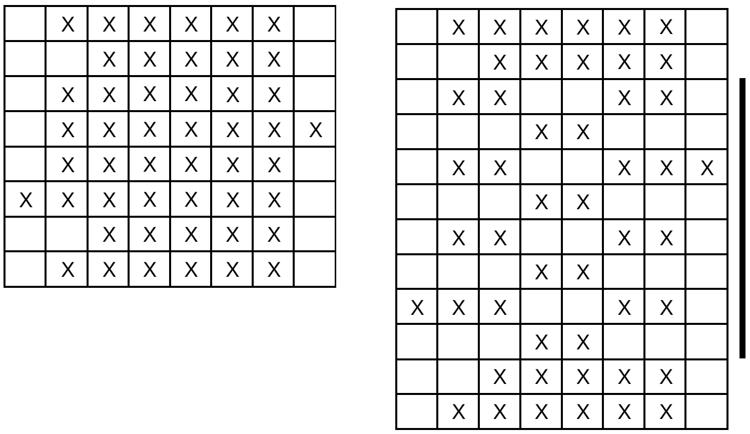
	O		O		O		O		O
O		O		O		O		O	
		X	X	X	X	X	X		
	X	X	X	X	X	X	X	X	
	O		O		O		O		O
O		O		O		O		O	
		X	X	X	X	X	X		
			X	X	X	X			
	O		O		O		O		O
O		O		O		O		O	
			X	X	X	X			
		X	X	X	X	X	X		
	O		O		O		O		O
O		O		O		O		O	
	X	X	X	X	X	X	X	X	
		X	X	X	X	X	X		

Fig. *Design of extra fabric with single colou*

Extra weft figuring with two colours

In this case two different colours or types of weft form the figuring threads and are inserted in addition to the ground threads. An example is shown in Fig. 13.5.

At A is shown the motif repeat on 8/8. The two extra figuring wefts are indicated by different notations (‘X’ and X). B shows the separation of the two figuring wefts and at C is shown the final design. The ratio of the ground to figuring threads is 2:2. The convention is reversed here also as in the previous case (‘X’ and X indicate weft lift).



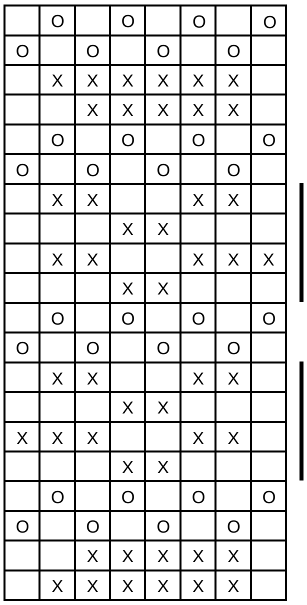


Fig. *Extra weft figuring*

Extra warp figuring	Extra weft figuring
1. No additional shuttle box and special take up mechanisms are required.	1. Drop box with modified take up mechanisms are required.
2. Additional warp beams (2 or more) are necessary.	2. Requires only a single warp beam.
3. As only one type of weft is inserted, the production is higher.	3. As drop box is used to insert two or more series of weft yarns, the production is lesser.
4. Striped and spotted effects can be brought out by alternately arranging the figuring threads.	4. Spotted effects are possible but striped effects are not effective.
5. Requires warp yarns of good strength.	5. Yarns of good strength are not a necessity.
6. Draft plans are usually more complicated.	6. Draft plans are simpler.
7. Figured effects exhibit less prominently.	7. Figured effects show more prominently.
8. It is more difficult and expensive to dispose the extra threads at places where they are not required.	8. The disposal of the extra threads is easier and more economical.
9. Posess a constraint in repeat size when working on an ordinary type of jacquard.	9. No such problems.
10. Scope for introduction of more colours.	10. Scope for colouring is restricted to capacity of shuttle boxes.