

Tapestry Structures

The classical tapestry was usually a structurally simple fabric in which the highly figured and elaborate design was produced by the placement of coloured threads within well-defined areas of the cloth. The warp was normally comparatively fine and of a neutral hue to prevent interference with the multi-coloured wefts in which the design was developed. The ends were operated in the plain weave order and into each shed small portions of weft would be placed, each short length conforming in colour with the painted design positioned directly behind the warp threads. Each equivalent of a pick in a normal cloth would, therefore,

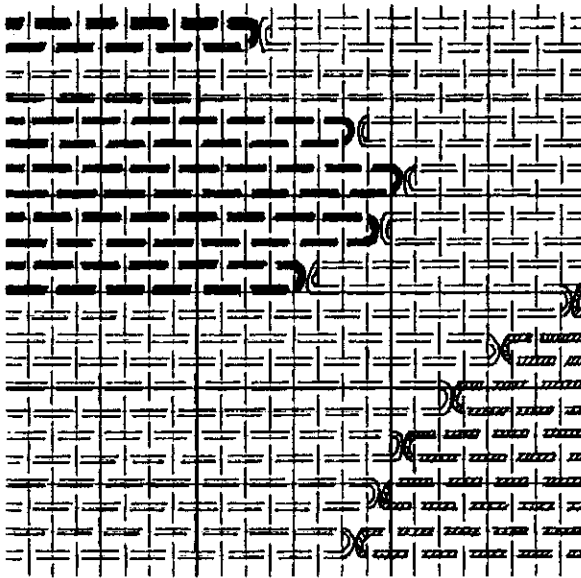


Figure 11.1

consist of discontinuous lengths of weft and the design would be built up, row by horizontal row, with the differently coloured lengths of weft occupying increasing or decreasing spaces in conformity with the changes in the dimensions of the figures as indicated by the interlacing diagram in *Figure 11.1*.

The warp sheet in the hand tapestry loom was frequently placed vertically and in broad tapestries several weavers would be stationed side by side, each responsible for a vertical strip of design of a given width, and each armed with a set of small hand shuttles containing the requisite colours of weft. The cloths produced in this manner usually consisted of single-repeat, large picture panels used mainly as wall hangings, and similar techniques were employed in tapestry weaving in most of the ancient civilisations. The highest peak of development of this art form in Western Europe was probably reached between the fifteenth and the seventeenth centuries in France and in the Low Countries where some of the most famous contemporary artists frequently engaged in the production of designs for tapestry panels. A facsimile reproduction of a sixteenth century tapestry picture in a miniature printed form is provided in *Figure 11.2*.



Figure 11.2

Although the making of tapestries in the manner described above is still practiced in various countries as a studio activity, the modern, machine-produced tapestry fabric has little structural affinity with the classical picture panel. The similarity between the two exists in that the figure in both is due to the display of colour but structurally many of the modern tapestry upholstery fabrics represent the most complex of the compound woven constructions. They may consist of several figuring warps and wefts as well as of stitching and ground yarn elements in both directions. They are produced on fine pitch jacquard machines for which the designs are prepared in the usual condensed form (see Chapter 1) the degree of condensation depending on the size of the structural unit. Thus, a tapestry cloth arranged with 3 figuring warps to 1 face and 1 back stitching warp, and 2 figuring to 1 stitching weft would be condensed by 5 warp-wise and by 3 weft-wise. The more complex of the structures frequently utilise the full capacity of modern card-cutting machinery for accommodating the different weave areas.

The tapestry construction has been used for hangings, sofa rugs, upholstery work, table covers and carpets. At present, fabrics of this type are mainly employed for the upholstery purposes for which the hard-wearing quality of the structure is particularly well suited. The figuring elements may consist of cotton, wool or man-made staple yarns; the ground warp, if present, is almost invariably a two-fold cotton yarn, whilst the stitching elements are frequently fine, two-fold cotton or filament nylon. The stitching yarns are an important element in the construction as they ensure cohesion and wear resistance of the fabric by preventing the formation of long floats whilst they may also add to the structural variety which can be enhanced by deliberately altering the appearance of similar colour areas by the changes in the order of stitching. Despite performing a vital role the stitching yarns must be unobtrusive and they must not interfere with the colour values of the main figure areas. For these reasons they are usually very fine (12 to 17 tex) and may be either dyed black or be entirely transparent as is the case with the fine filament nylon yarns.

SIMPLE WEFT FACE TAPESTRIES

These represent the least complex of the tapestry structures and consist of a ground warp the lifts of which determine the disposition of the figuring wefts, the stitching warp, and a number of figuring wefts. The wefts, of which there are usually between two and four, interchange between the face and the back of the cloth thus producing a design in the number of colours equal to the number of different wefts. It will be appreciated from the examples which follow that



Figure 11.3

in a 2-weft tapestry it takes two picks to complete a horizontal row of the design; in a 3-weft structure—three picks, and in a 4-weft—four picks. Thus, if other conditions remain equal, a 2-weft tapestry is produced at twice the rate of a 4-weft fabric with an obvious advantage in respect of the cost of production.

The stitching warp operates in a regular order stitching the weft floats both on the face and on the back so that no long floats are formed in any part of the fabric. Occasionally, the ground warp is also used for figuring on the surface thus adding another ornamental feature without increasing the cost of production.

Two-weft tapestry structures

Figure 11.3 represents a fabric in which the design is due to the interchange of two differently coloured wefts while a portion of the corresponding design given at A in Figure 11.4 illustrates the simplified and condensed method of painting adopted for these structures. The warp is arranged 1 stitching end to 1 ground end, although in the heavier structures there may be 2 ground ends to 1 stitching end.

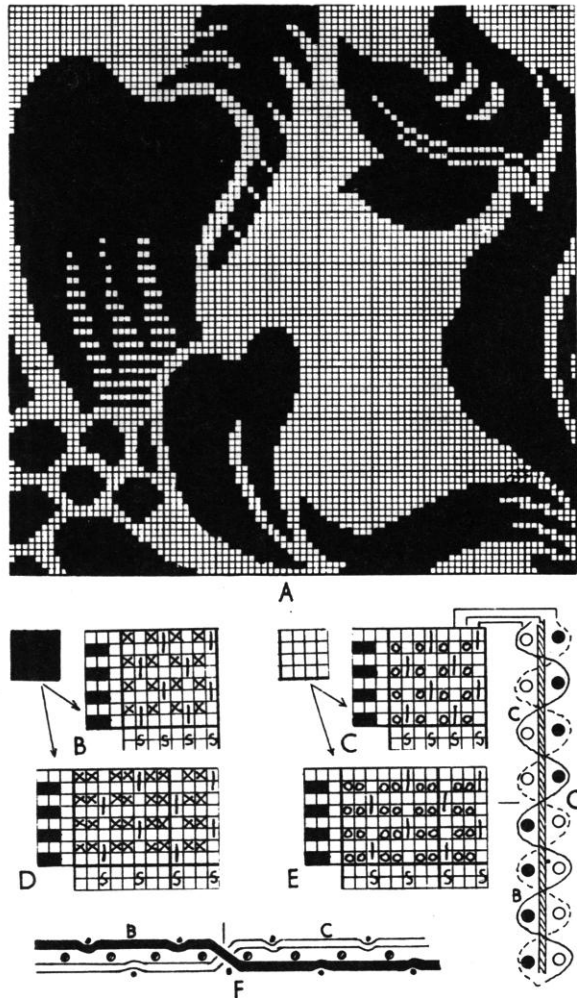


Figure 11.4

In the latter case the 2 ground ends are usually operated as one, being placed in a decked mail eye (q.v.) so that the jacquard operation is identical with the former case and only an expansion of the repeat size is obtained.

The detailed weave for the parts of the design painted solid in A is given at B, whilst C illustrates the weave of the blank portions of A. The crosses and the circles in the weaves B and C represent the lifts of the ground warp and the vertical lines indicate the lifts of the stitching ends. D and E in *Figure 11.4* correspond respectively to B and C and show the construction of the double ended version of the structure. The warp section through the fabric given at F shows clearly the interchange of the figuring wefts whilst the operation of the stitching ends becomes obvious upon studying the weft section at G.

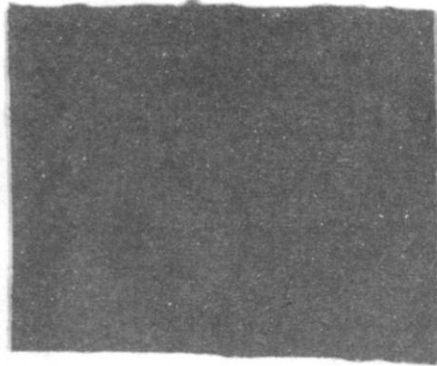


Figure 11.5

Although structurally the 2-weft tapestries are quite simple, considerable differences in their appearance can be obtained by changing the orders of arrangement of ground and stitching warp ends or by changing the order of operation of the stitching ends. The fabric in *Figure 11.5* represents a simple 2-weft tapestry with a distinctly ribbed appearance achieved by arranging the warp in the ratio of

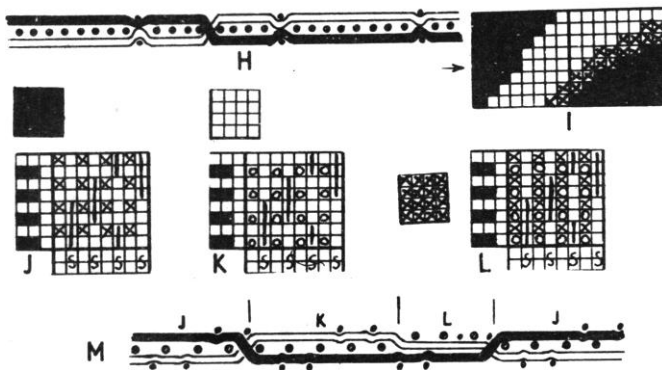


Figure 11.6

8 ground ends to 2 stitching ends which is shown by the warp section at H in *Figure 11.6*. In *Figure 11.7* another 2-weft tapestry is given where the difference in the appearance is due to the order of operation of the stitching ends which in

this cloth work in a broken twill weave order. In addition this fabric also illustrates the use of the ground warp as a figuring element. A portion of a condensed design for the latter construction is shown at I in *Figure 11.6* where it will be noted that a third colour, represented by the crosses, is used to denote the areas in which the ground warp is raised to the surface. The detailed weaves for each different area of figure in this cloth are given at J, K and L with the warp section through the fourth row of the design I being shown at M in *Figure 11.6*.

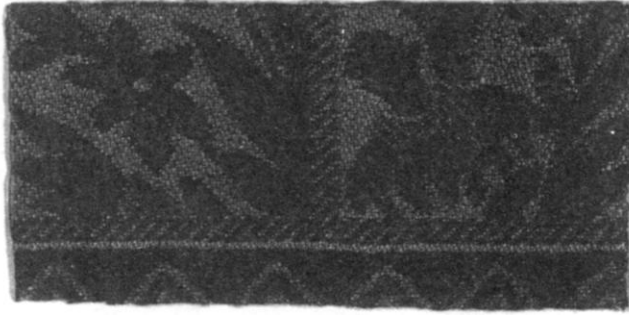


Figure 11.7

As the ground warp cannot be stitched, there being no weft stitching elements, its use is confined mostly to outlining the weft figure for the purpose of greater emphasis where it can enhance the general appearance without creating an excessively long float. If the ground warp is not used for figuring then the 2-weft tapestry cloth is perfectly reversible, a dark figure on a light ground being formed on one side, and a light figure on a dark ground on the other side. Sometimes, however, one of the wefts is chintzed (q.v.) in order to develop some portions of the figure in different colours, in which case the cloth is not reversible, because the chintzed weft produces horizontal bands of colour in the ground on the underside. The cloth in *Figure 11.7* represents an example of a chintzed development of the figure in a 2-weft tapestry structure. All the fabrics given in the foregoing show typical upholstery cloths but exactly the same interlacings can be used to produce rugs and carpets, the only difference being in the coarseness of the yarn elements used. The structures particularly well suited for the production of such rugs are those given at D and E in *Figure 11.4* which are sometimes enhanced by the extensive use of the chintzing techniques.

Three-weft, and four-weft tapestry structures

These fabrics represent a further development of the 2-weft tapestry from which they differ mainly in the number of the differently coloured figure areas which can be achieved. When one of the wefts is displayed on the surface the remaining ones weave together on the underside and for this reason the standard 3-weft, and 4-weft constructions are not reversible which will be seen clearly by reference to the sectional diagrams given at A, B, E and F in *Figure 11.9*. A and B show respectively a warp and weft section of a 3-weft tapestry whilst E and F illustrate the corresponding sections of a 4-weft tapestry.

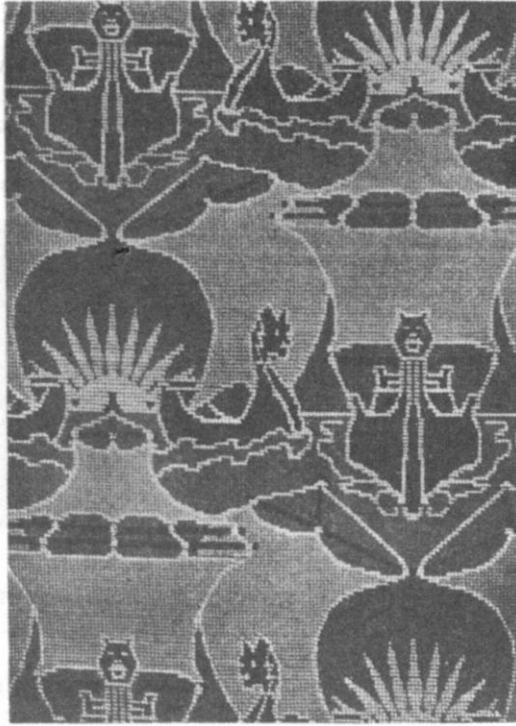


Figure 11.8

The fabric illustrated in *Figure 11.8* is an example of a 4-weft tapestry composed as follows: 2 stitching ends of 14/2 tex cotton, 2 ground ends of 60/2 tex cotton, 24 ends per cm. The weft is 170 tex staple viscose (low twist, long staple) yarn, 6 picks of each colour per cm. Although the actual cloth sample contains four wefts the above particulars are equally applicable to fabrics containing fewer or greater numbers of wefts as long as they are constructed with 6 horizontal design rows per cm. A portion of the condensed design suitable for this cloth is given at C in *Figure 11.9* in which four colours are used to denote an area in which each of the four different wefts is displayed on the surface. The degree of condensation is by 4 weft-wise and by 2 warp-wise so that each horizontal row of the design represents a complete structural row of the fabric and each vertical row represents one ground end and one adjacent stitching end. The stitching ends operate continuously 4 up, 4 down as indicated clearly in the section F and when the cloth is woven face side up the ground ends are raised on all the wefts which are not required at that point on the face and remain down on the weft which does form the face float. As this method of weaving results in very heavy lifts it is more usual to weave such fabrics face side down in which case, on average, only one-quarter of the total number of ground ends is up on any given pick. A fully worked-out structure for the seventeenth and eighteenth horizontal rows of the design across the vertical rows 17 to 40 is given at D and shows the detailed weaves for each differently coloured area of the condensed design when the cloth is woven face side down. At D the lifts of the

stitching ends are denoted by the vertical lines whilst the lifts of the ground ends are represented by the marks used in the design to show where each weft is displayed on the surface except that crosses are employed to show the lifts of the ground ends on the weft represented by the blanks in the condensed design. The warp section at E fully conforms to the first four rows of the design D as indicated by the brackets.

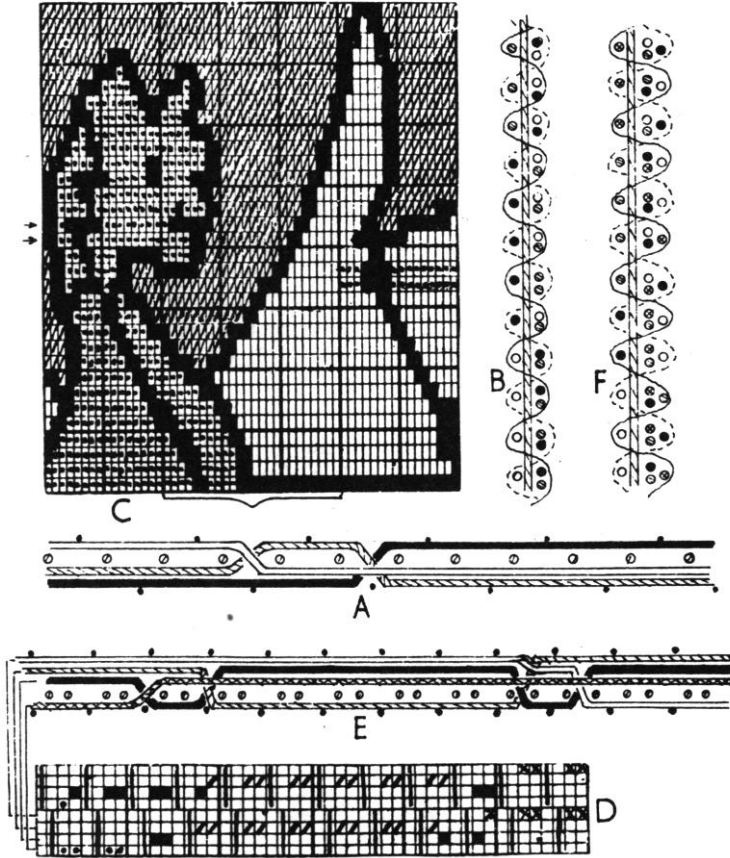


Figure 11.9

In 3-weft, and 4-weft tapestries effects can be produced simply in three or four colours by displaying the different colours of weft on the surface as shown in the fabric given in *Figure 11.8*, in addition, however, all the structural modifications considered in respect of the 2-weft tapestries can also be employed. Thus, the ground warp can be brought to the surface as an additional figuring element and various orders of stitching can be applied to the different colour areas. It is also possible to stitch the same colour areas in different orders thus changing the texture of one in respect of another. Sometimes two figuring wefts are brought to the surface together resulting in a mixed colour area. This technique, however, is used infrequently as it produces a somewhat indeterminate effect.

Three-weft, and four-weft reversible tapestries

In upholstery fabrics there is no reason to produce reversible structures because only the face side of the fabric is displayed to view. In rugs, however, both sides of the fabric may be utilised and for this purpose the 3-weft, and 4-weft tapestry structures may be arranged so that either surface is equally pleasing aesthetically. In such fabrics the figuring wefts are arranged in three layers so that when one weft forms the figure on the surface another colour forms an identical figure on the back and the remaining weft colour or colours act as wadding yarns in the centre. The stitching ends are not affected by this system and it is only the ground ends that determine which colour of weft is to be placed in which layer. Thus, when it is intended to display a figuring weft on the face all the ground ends in that area are dropped, if the second weft is the one chosen to appear on the back then all the ground ends are raised in that area, and to contain the wefts unwanted either on the face or on the back half the ground ends are raised, say, all the odd ground ends, so that such wefts remain quite invisible in the centre layer between the raised odd, and the lowered even ground ends. The result of this type of manipulation is shown clearly in the warp sections given at A and B in *Figure 11.11* which respectively refer to a 3-weft, and a 4-weft reversible tapestry structure.

The fabric shown in *Figure 11.10* is an example of a heavy 4-weft rug construction made as follows: 1 stitching end of 74/3 tex cotton, 2 ground ends of 320/2 tex staple viscose rayon, 10 ends per cm; weft-400 tex woollen yarn, 6 picks of each colour per cm. Due to the coarseness of the weft the stitching warp is very highly crimped, sometimes exceeding 100 per cent, whilst the ground ends lie almost straight.

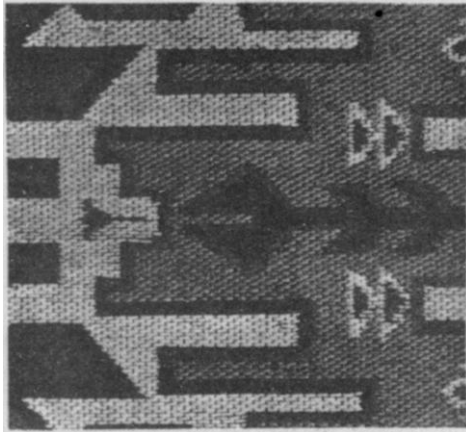


Figure 11.10

C in *Figure 11.11* shows a portion of the condensed design painted in four different sets of marks to denote the four colours of weft with the detailed weaves for each area being shown at D, E, F and G. It will be noted from the detailed weaves that, numbering the wefts in the order in which they are inserted, the following scheme is produced:

Weft No. 1 on the face, weft No. 3 on the back, wefts No. 2 and 4 in the centre.
 Weft No. 2 on the face, weft No. 4 on the back, wefts No. 1 and 3 in the centre.
 Weft No. 3 on the face, weft No. 1 on the back, wefts No. 2 and 4 in the centre.
 Weft No. 4 on the face, weft No. 2 on the back, wefts No. 1 and 3 in the centre.

Thus, the wefts 1 and 3 supplant one another between the face and the back and so do the wefts 2 and 4. Although in the scheme shown the odd and the even

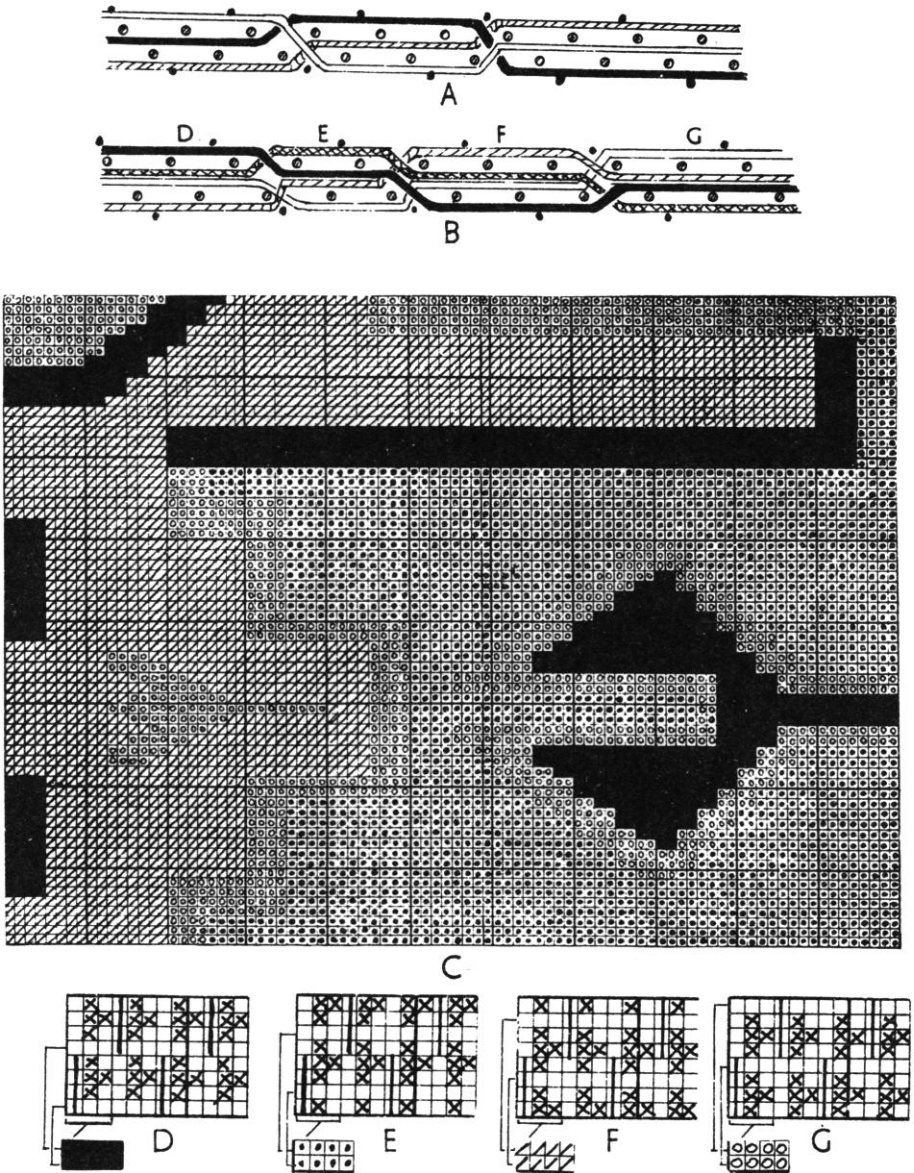


Figure 11.11

picks are paired together this is in no way compulsory and any one colour of weft can be made to supplant any other with equal facility. The interchange of the wefts can be followed by studying the warp section at B which corresponds to the scheme given above.

In the example given the stitching ends operate 4 up, 4 down, on an alternate basis as shown by the vertical lines in plans D to G and due to their distribution the face and the back of the cloth appear to be stitched in a plain weave order. If, however, the ends were distributed in the order of 4 ground, 2 stitching then a ribbed appearance could be achieved similar to the one illustrated in *Figure 11.5*. As this results in longer weft floats it is reserved mostly for the lighter weights of rugs which are not expected to undergo such severe wear as the heavier construction illustrated in *Figure 11.10*.

REPP-STITCHED WEFT FACE TAPESTRY STRUCTURES

Due to their complexity these structures were at one time woven on special harness mountings which in addition to healds also included lifting rods. An example of this form of harness, devised to simplify the painting and card-cutting of the designs, is given in Appendix I. At present this type of tapestry in common with other similar structures is produced on fine pitch jacquards and the employment of modern card-cutting machinery permits the use of simplified methods of design painting. The effect is most commonly produced in three figuring wefts with the ground warp elements contributing a fourth colour area on the face and a fabric of this type is represented in *Figure 11.12*. The tightly



Figure 11.12

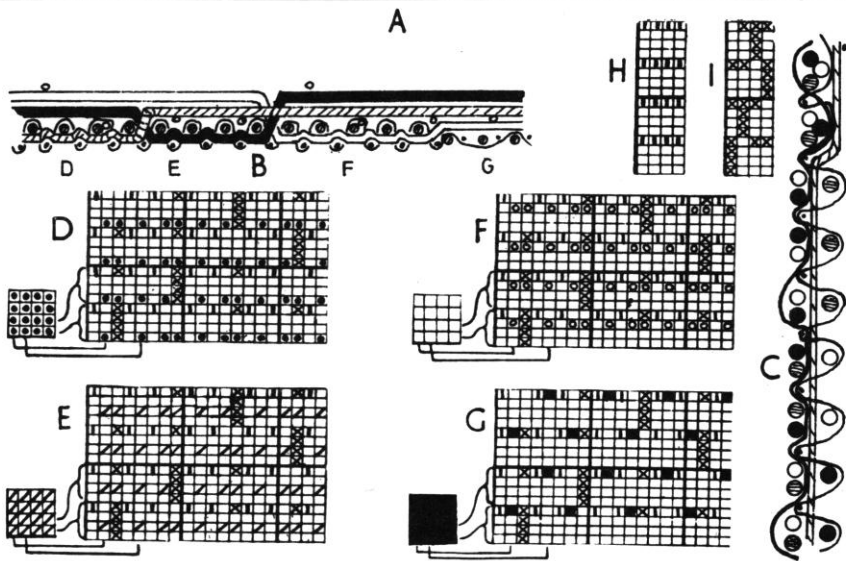
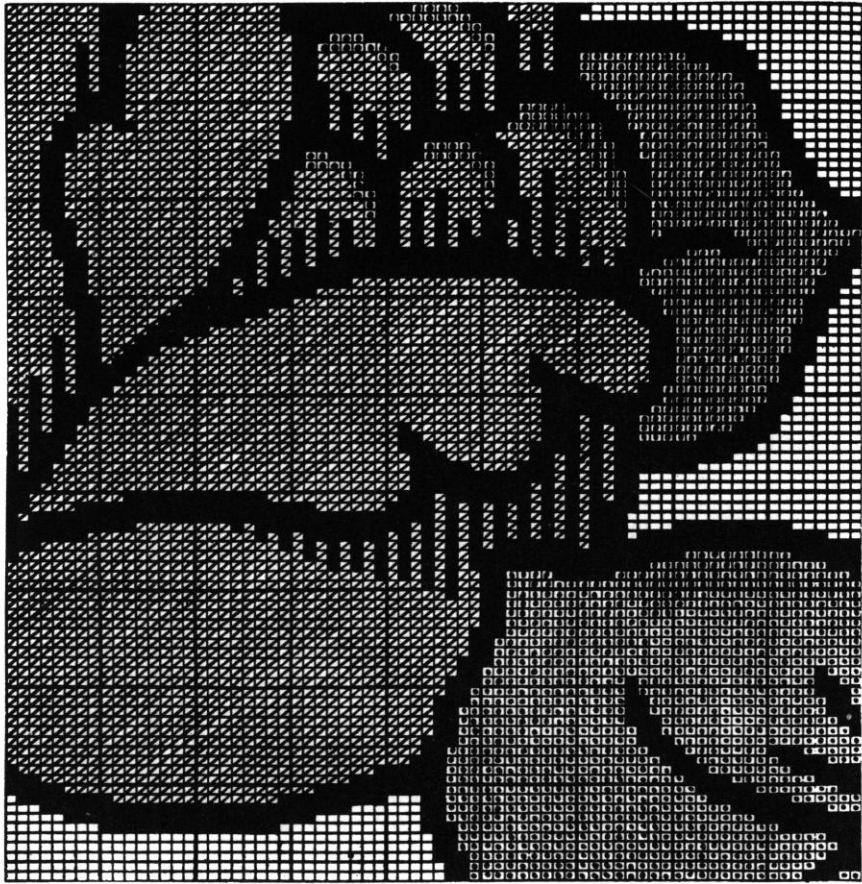


Figure 11.13.

stitched and finely ribbed surface is due to the use of a face stitching warp in conjunction with a stitching weft yarn. The close binding of the face results in a very superior upholstery cloth in which the figuring wefts will not slip or roll due to rubbing. The back of the cloth, which is separated from the face by the ground warp, is loosely stitched by special back stitching ends to accommodate the excess material without straining the face and to permit easy flexing of the fabric to conform to the shape of the furniture. In the cloth illustrated in *Figure 11.12* the following yarns and settings have been used: Warp arrangement—1 ground end, 1 face stitching end, 1 back stitching end, 1 ground end, 1 face stitching end, 24 ends per cm; all the warp yarns are cotton, the count of the ground ends being 48/2 tex, and of the stitching ends 14/2 tex; a three-beam mounting is necessary due to considerable differences in the crimp of the different warp yarns, which is respectively 3 per cent, 27 per cent and 8 per cent for the ground, the face, and the back stitchers. The weft is arranged 3 figuring picks to 1 stitching pick, 12 picks of each weft per cm; the figuring yarns are cross-bred or lustre worsted, 98 tex, and the stitching weft is the same as the warp stitchers, i.e. 14/2 tex cotton.

As the ratio of the ground ends to the face picks is in the proportion of 48 : 60 per unit space the count of design used for the simplified design should be 8 X 10. The ground ends are used in emphasising the outline of the ornament and in shading the figure, as shown by the solid marks in the simplified design A in *Figure 11.13*, whilst the main ornamental features are produced by the three figuring wefts, as represented by the dots, diagonal marks and blanks respectively.

The cloth is woven face side down to avoid heavy lifts and is thus represented by the warp section at B in *Figure 11.13* in which the four different figure areas are lettered D, E, F and G to correspond with the detailed weaves of each area given alongside. As each horizontal row of the simplified design is representative of four picks, 3 figuring and 1 stitching, it is necessary to cut four cards from each row, the order of cutting for every weft in each differently operated design area being given by the fully worked-out weaves at D to G. The order of interlacing of the face and back stitching warps is also given separately at H and I in *Figure 11.13* from which it will be noted that the face stitcher is dropped on all the figuring wefts and raised on the stitching pick, whilst the back stitching warp is raised to stitch the back of the fabric in a satinette order dropping on the stitching picks in a reverse satinette order to bind the figuring picks which float on the back to the ground structure. From the fully worked-out plans it can also be noted that the back stitchers are not permitted to show on the face (underside, as woven) of the cloth and are, therefore, raised above every figuring pick of weft when it forms the face effect even though it appears according to the basic weave given at I that they should be down. The operation of the warp stitching elements is clearly shown in the weft section at C. The marks in the detailed weaves all indicate warp ends up in weaving the cloth face side down. It will be appreciated that if it is desired to weave the cloth the right way up blanks instead of marks should require to be cut.

COMBINED WARP AND WEFT TAPESTRY STRUCTURES

The cloth in *Figure 11.14* illustrates a complex tapestry structure in which the effect is achieved primarily by the use of several differently coloured figuring

warps. Although the warp in this type of structure represents the main figuring element, figuring wefts are also used to enhance the diversity of patterns which can be obtained. The upholstery fabrics in this class of construction produced at present contain between three and five series of figuring warp ends and two figuring wefts. The warps are comparatively fine and when operating on the face do not cover the picks completely thus making it possible for the weft to be visible. The two figuring wefts are quite coarse and are usually in two strongly contrasting colours—one very dark and the other very light. Being visible, each weft is capable of influencing to a considerable extent the colour of a given warp which rests upon it such that the same warp colour area looks quite different depending upon which weft forms the background to it. To give an illustration, it will be appreciated that when a blue warp operates on the background of a fawn weft the hue of this portion of the design differs vastly from another area in which the same blue warp is backed by a brown weft. Thus, using the above method in which both wefts form an effect in conjunction with any one of a number of warps it would be possible to produce 10 distinct colour areas with five figuring warps and two contrasting wefts. In addition, it is possible to produce other areas in which each weft figures on the face independently. Being much coarser than the warp it will cover the surface completely without permitting any adulteration of its own colour. Further increase in the diversity of colour ornamentation is possible by colour planting in the warp and this is frequently resorted to. The figuring yarns are closely bound by the warp and weft stitching elements which help to achieve a distinctly ribbed, hard wearing surface.

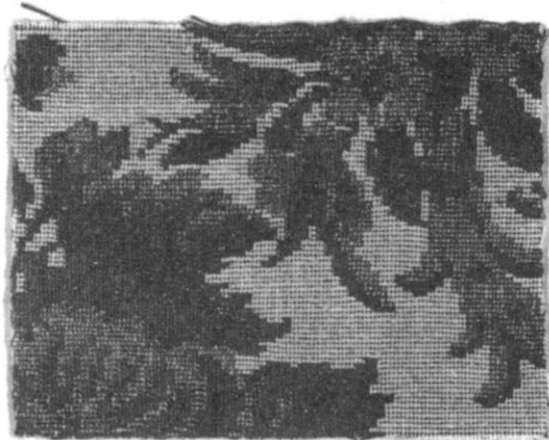


Figure 11.14

A good quality cloth as shown in *Figure 11.14* may be produced with the following particulars: Warp—1 stitching end, 12/2 tex cotton; 3 to 5 figuring ends, 40/2 tex spun viscose staple; 108 ends of each kind per 10 cm; weft—2 figuring picks, 115 tex condenser spun cotton; 1 stitching pick, 17 tex filament rayon; 92 picks of each kind per 10 cm.

In a construction embodying 1 stitching and 3 figuring ends, and 1 stitching and 2 figuring picks the natural degree of condensation in the preparation of a simplified design would be by 4 warp-wise and by 3 weft-wise, one small

square of design paper thus representing a complete structural unit. The number of different colours used in a simplified design depends on the number of colour and structural areas produced. In the example worked out in *Figure 11.15* eight different colours have been used and these are shown in the plans A to H. The simplified plans are connected by lines with the corresponding detailed weaves in which the marks indicate warp up. The first, second and third figuring warps are respectively interwoven with the first figuring weft at A, B and C, and with the second figuring weft at D, E and F, whilst in G the first, and in H the second figuring weft is brought to the surface. The vertical marks in the detailed weaves indicate the lifts of the stitching ends, and distinctive marks, which correspond to those shown in the simplified plans A to F, represent the lifts of the figuring ends in forming the surface effect, whilst the diagonal marks show the other lifts of the figuring ends.

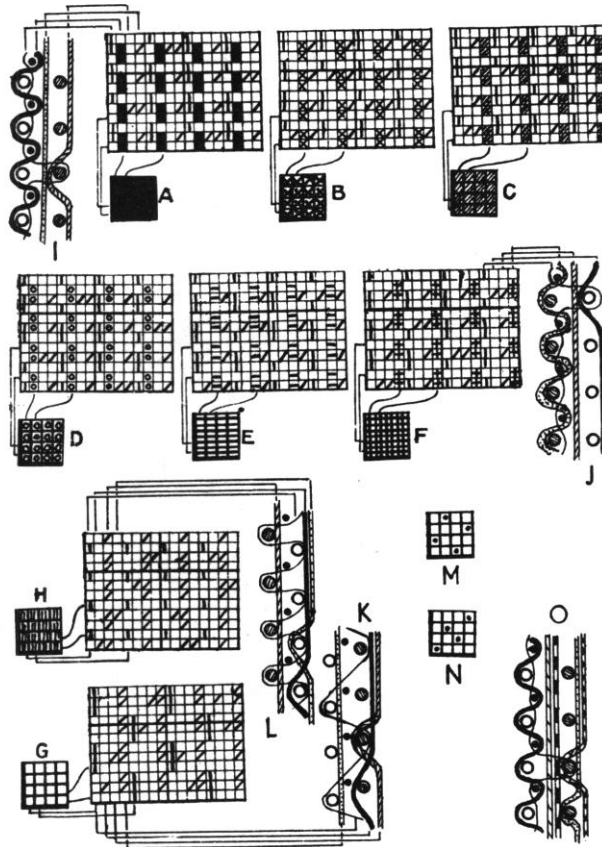


Figure 11.15

In each weave A to F the figuring warp required on the surface floats over both figuring picks and under the stitching pick thus making a continuous 2 up, 1 down interlacing. One of the remaining figuring warps acts as wadding and separates the wefts into a face and a back layer being operated in a continuous

1 up, 2 down order. The third figuring warp floats on the back and is loosely stitched into the body of the fabric in a satinette order as given at M or N. The stitching warp is down on the face figuring weft and up on the back one except when it is dropped to stitch through to the back which is done in a satinette order corresponding to the one given at M or N but operating in reverse. The stitchee is also invariably raised on each one of the stitching picks thus being responsible for the characteristically ribbed appearance of this class of structure. The manipulations of the various elements are clearly shown in the weft sections at I and J which correspond with the detailed weaves at A and F respectively. It will be appreciated that all the areas A to F are structurally similar and the differences in them are due entirely to colour. This structural similarity is also independent of the number of figuring warps used so that in a fabric containing, say, five figuring warps the face structure would be exactly as that given in the sections I and J, and only the number of wadding and backing yarns per vertical row would increase as depicted in the section shown at O.

The detailed weaves at G and H in *Figure 11.15* and the sections K and L show the figuring weft float areas in the fabric. When one of the figuring wefts is floated on the surface one figuring warp acts as wadding being placed directly underneath the face weft and above the other figuring weft and the stitching weft. The remaining two figuring warps float on the back and are stitched in to the figuring weft on the back in a satinette order, one as at M and the other as at N. Again the two areas are structurally similar the difference depending on the colour of figuring weft which floats on the face. In G and H, however, the structures are different because each illustrates a different method of stitching the float of the figuring weft. The differences are particularly clearly shown in the corresponding sections at K and L where it can be observed that whilst the first weft at K is bound rather loosely in an alternate order by the stitching warp operating 3 up, 3 down, at L the second weft is repp-stitched by means of 1 up, 2 down operation of the stitching warp. The differences in the method of binding result in a sufficiently different surface appearance to permit their utilisation as additional effect areas; thus, if required, the cloth described above could be painted in 10 colours, six of which would correspond to the warp face effects as at A to F, whilst the other four would refer to the areas of weft float in which each of the two figuring wefts would be displayed first in a loosely bound, and then in a repp-stitched form.

Although in the foregoing only one principle of figuring has been explained it will be readily appreciated that in view of the presence of a large number of yarn elements in the warp and in the weft a considerably greater structural diversity could be achieved. Thus, the tapestry structure could be combined with areas of wadded double cloth or treble cloth, other effects could be formed by floating the figuring elements without stitching in the manner of extra warp or extra weft and so on. In respect of the diversity of effect it is worthwhile to note that the filament rayon weft stitchee, which is one of the elements in the cloth described in detail above, has been employed in a deliberate attempt to enhance the general appearance of the fabric. This weft, which in the figuring weft float areas is entirely invisible, in the warp face areas is visible to a minute extent in the 'furrows' between the ridges formed by the figuring elements (note sections I and J). Due to its high sheen it provides, at certain angles of reflection,

a shimmering depth which sets off the duller figure areas perfectly. Thus, with a degree of ingenuity and some knowledge of materials available it is possible to make even the comparatively insignificant and utilitarian elements of the construction contribute to the aesthetic appearance of a cloth.