June 2, 1959 A. JACOBY ET AL 2,888,815

EMBROIDERED WARP-KNIT TRICOT FABRIC

Filed April 16, 1958 3 Sheets-Sheet 1

FIG. 1

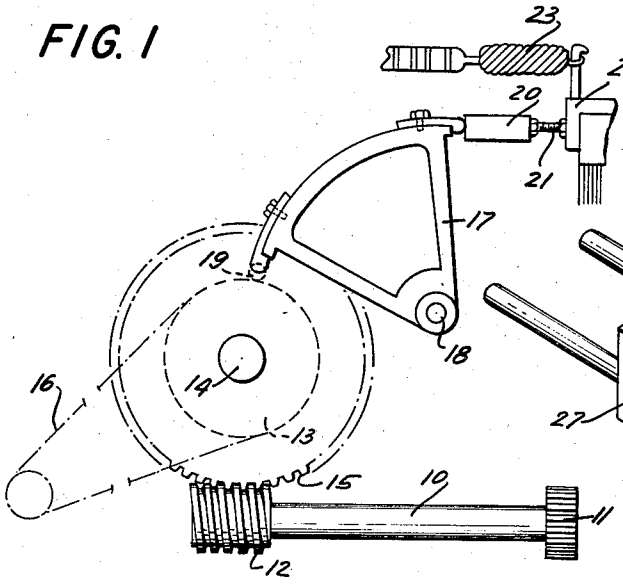


FIG. 3

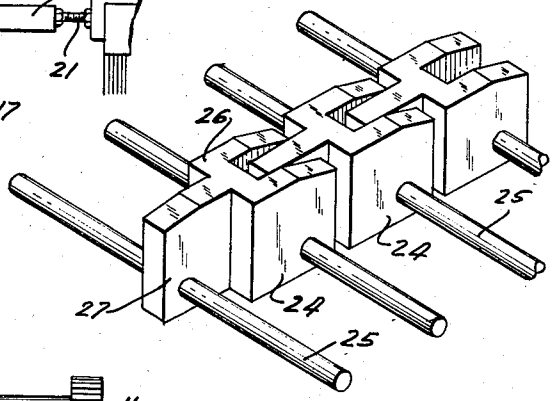
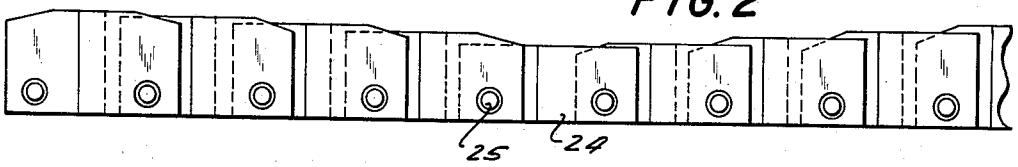


FIG. 2



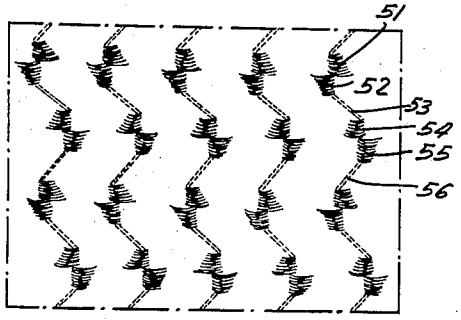


FIG. 5

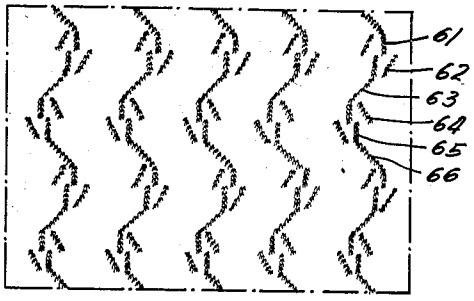


FIG. 6

INVENTORS
PHILIP JACOBY
ARNOLD JACOBY
BY Milton Jusler
ATTORNEY

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EMBROIDERED WARP-KNIT TRICOT FABRIC

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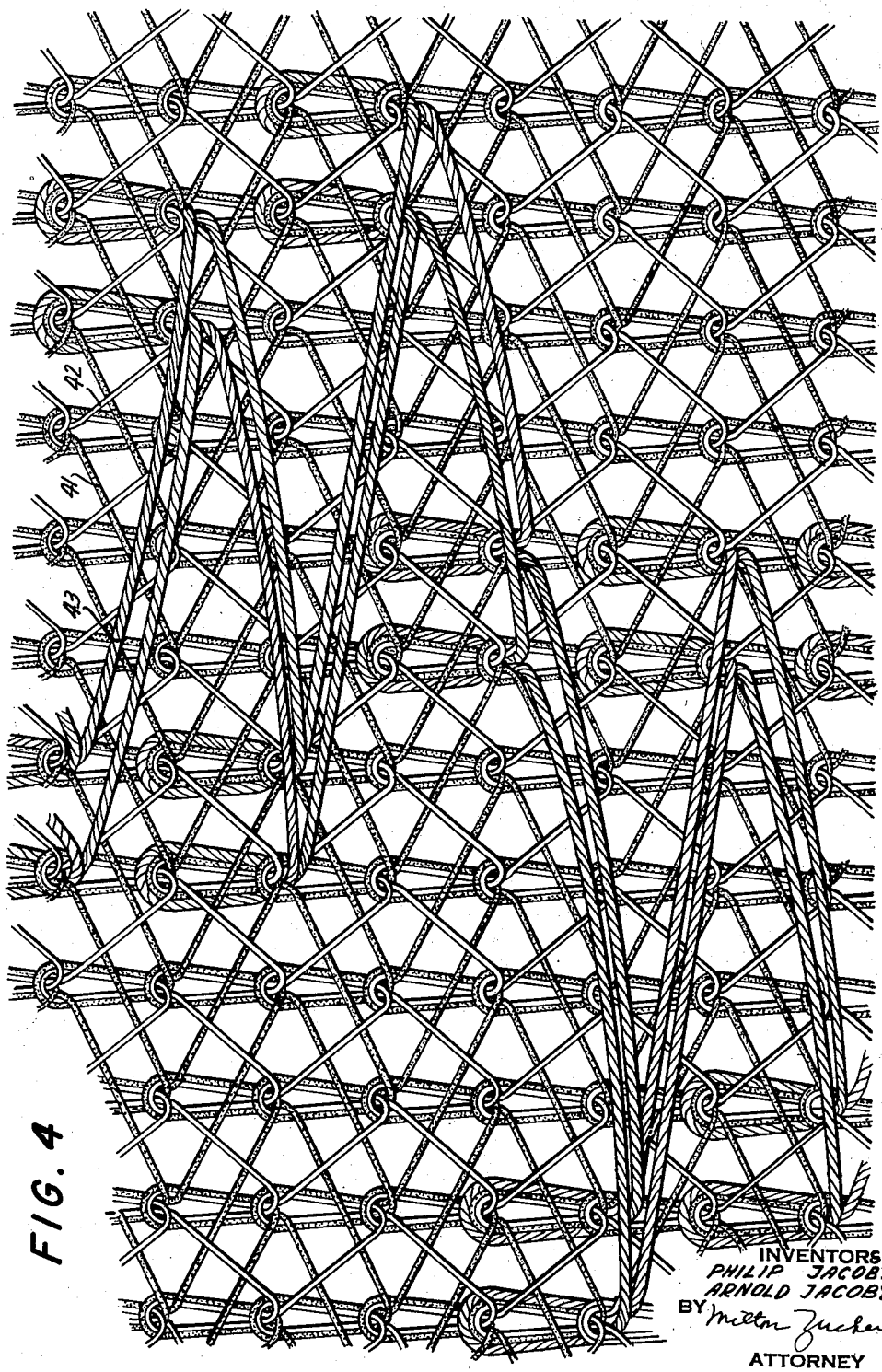


FIG. 4

INVENTORS
PHILIP JACOBY
ARNOLD JACOBY
BY Milton Zucker
ATTORNEY

June 2, 1959 A. JACOBY ET AL 2,888,815

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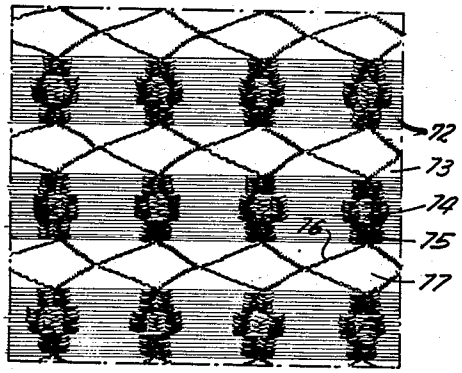


FIG. 7

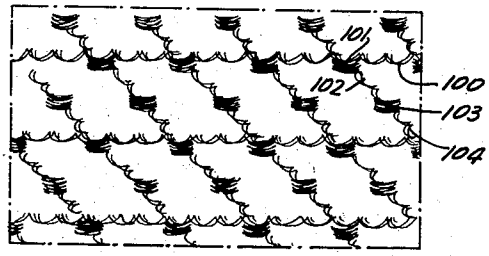


FIG. 10

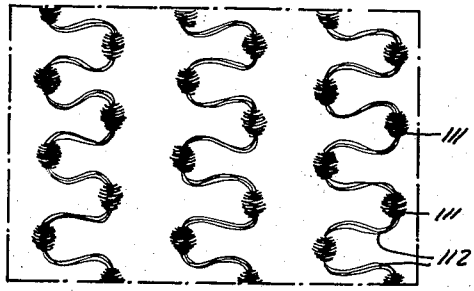


FIG. 11

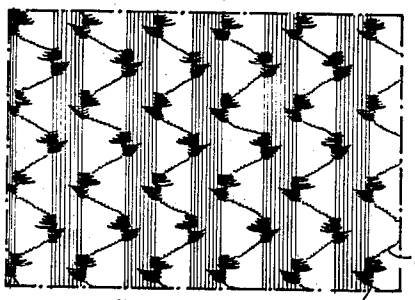


FIG. 9

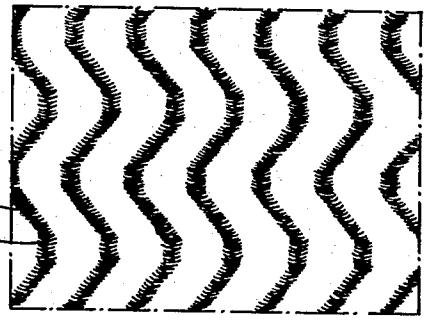


FIG. 12

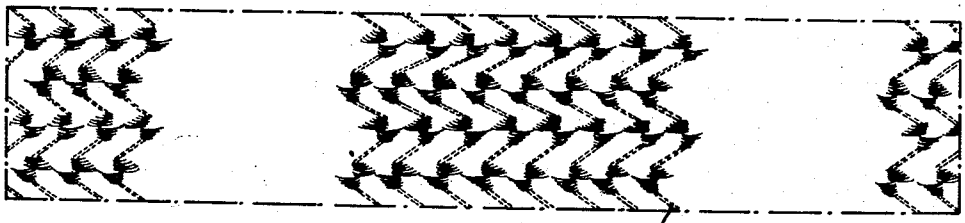


FIG. 8

INVENTORS
PHILIP JACOBY
ARNOLD JACOBY
BY Milton Jacobs
ATTORNEY

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2,888,815

EMBROIDERED WARP-KNIT TRICOT FABRIC

Arnold Jacoby and Philip Jacoby, New York, N.Y.

Application April 16, 1958, Serial No. 728,907

8 Claims. (Cl. 66—195)

This invention relates to tricot fabrics, and aims to provide novel embroidered tricot fabrics which are inexpensive and are nevertheless superior to tricot fabrics embroidered by conventional methods, and also to provide novel means of making such fabrics, and of operating the standard single needle-bar, multiple guide-bar, bearded-needle warp knitting machines which are conventionally used for knitting such fabrics.

Fabrics are conventionally embroidered by cutting previously prepared material into pieces of 10, 15 or 20 yards in length, the sizes which fit the standard embroidery machines. These machines sew the embroidery yarn to the fabrics, in any desired design, by the use of multiple needles which attempt to duplicate the effect of hand embroidery. The process is expensive, and markedly reduces efficiency in the garment plants which use the fabrics, since the relatively small size pieces are difficult to fit to cutting patterns designed for the longer lengths of fabric generally available.

There has consequently been a substantial demand in the garment trades for embroidered fabrics in the standard size pieces of 100, 200 yards and longer, which are obtainable from standard weaving and knitting machines.

The principal object of this invention is the preparation of embroidered tricots in a single operation, in which the base cloth and the embroidered design are knit as a single unit so that the embroidered cloth can be made available in the same size units as ordinary tricots.

Another object of the invention is the production of novel embroidered tricots in which the embroidery yarns, while free above the fabrics through the body of the design, are knit unitarily into the cloth about the edges of the embroidery design, so that the resultant embroidered tricots are superior both in wearing qualities and in design matching to tricots embroidered by conventional methods.

A further object of the invention is a reduction in the cost of embroidered tricots.

An additional object of the invention is a modification of the conventional methods of operating tricot knitting machines whereby the improved fabrics of the invention can be produced without causing damage to the machines.

These and other objects of the invention are obtained, in accordance with this invention, by knitting an ordinary tricot fabric from base fabric threads furnished by one or more guide-bars of a standard single needle-bar multiple guide-bar bearded-needle warp knitting machine while simultaneously applying the desired embroidery threads, which are much heavier and preferably of contrasting sheen or color from the base fabric threads, in spaced groups, by means of one or more additional guide-bars which are only partially threaded, to produce spaced massive embroidery designs in which the embroidery threads are knit into the base fabric at the edges of the designs, while the embroidery threads lay over the fabric and free of it in the body of the design, for at least

several courses over several wales, to produce the massive elements of the design.

In operating such a knitting machine according to this invention, the fabric-producing guide bars are threaded in conventional fashion; the embroidery thread guide-bars are threaded in groups of threads, spaced apart as desired by design considerations. The thread groups generally contain 1 to 5 threads, although more are sometimes used for unusually heavy designs. The groups are spaced apart so that the embroidery threads represent less than 25% of the available threading across the fabric.

The pattern wheels or chain for the embroidery thread guide-bars are selected so that in making an embroidery design element, a holding stitch is knit at the edge of the design in the first course, the embroidery thread is thrown over the face of the fabric, across as many wales as that portion of the design requires, a holding stitch is knit at the other wide of the design in the next course, the embroidery thread is thrown back as far as required by the design and a holding stitch knit in the next course, and so on, back and forth across the fabric next course, the embroidery thread is thrown back as far as required by the design and ah olding sitch knit in the next course, and so on, back and forth across the fabric until the design is completed. The thread is preferably then knit into the fabric for as many courses as the design requires before the next embroidery element is produced; or it may less preferably be floated from course to course free of the fabric between elements, and either left as a line of embroidery, or clipped off.

Because the design elements in embroidery are massive in effect, substantial throws are involved for the embroidery thread guides; throws over 5 to 7 wales are common, and longer throws are sometimes desired for certain designs. To accommodate such long throws and still get smooth operation of the machines, in accordance with this invention the pattern wheel operating the guide-bars is speeded up in some fixed ratio, and intermediate links are provided in the pattern chains to smooth out the transition from a low link to a high link in a single throw, or vice versa. By speeding up the pattern wheel, for example by a factor of three, a six-wale throw is accomplished as smoothly as a two-wale movement in conventional operation of the machine. The speedup used with any design is thus obviously a function of the maximum throw demanded by the design.

The yarns used for the embroidery patterns must be of substantially heavier construction than the base fabric, or the desired effect will not be obtained. Generally, it is preferred that they be of contrasting luster or color to the base fabrics, to accentuate the effect.

It should be noted that in the fabrics made in accordance with the present invention, the embroidered face of the fabric is made on the side of the knitting machine which produces, in conventional practice, the back of the fabric.

The invention can best be understood by reference to the drawings which illustrate a typical pattern wheel mechanism, and typical designs which can be produced in accordance with the instant invention. It will be understood that the illustrated designs are selected by way of example only, and not by way of limitation, and that the designs can be varied widely without departing from the invention, which is defined in the claims.

In the drawings:

Figure 1 is a schematic diagram of a typical pattern wheel used to control the movement of the guide-bars in a standard single needle-bar multiple guide-bar bearded-needle warp knitting machine, such as is used for knitting tricots;

Figure 2 is an elevation of a piece of pattern chain;

Figure 3 is a perspective view of a piece of pattern chain;

Figure 4 is an enlarged view of a fabric made according to the invention, showing the thread relationships;

Figure 5 is a face view of the fabric of Figure 4, made in accordance with the invention on a three-guide-bar machine, using two guide-bars for the base fabric and one bar for the embroidery;

Figure 6 is a rear view of the fabric of Figure 5, showing the embroidery threads only at the points at which they are knit into the fabric;

Figure 7 is a face view of a fabric in accordance with the invention, made on a three guide-bar tricot machine, with the back bar knitting a transversely striped fabric including a colored thread, the middle and front bars being used to produce an embroidered design thereon;

Figure 8 is a face view of a fabric showing a variation of the basic embroidery design of Figure 5;

Figure 9 is a face view of a fabric showing a further variation obtainable with the basic embroidery design of Figure 5;

Figure 10 is a face view of a fabric made in accordance with the invention in which embroidery yarns are floated free of the fabric between embroidery repeats;

Figure 11 is a similar view showing a fabric with a polka dot figure, with loose embroidery yarns between the polka dots; and

Figure 12 is a similar view showing a fabric in which the embroidery is a series of continuous zig-zag stripes running down the fabric.

Referring to Figure 1, a shaft **10** is driven by means of change gears **11** from the main shaft of the knitting machine. By changing gears **11**, any speed can be obtained for the pattern wheels relative to the knitting machine. The shaft carries a worm **12** which drives the pattern drum **13** turning on a shaft **14** by means of meshing gears **15** carried on the shaft. The desired pattern chains **16**, one of which is shown, are mounted on the pattern drum **13**, and control the individual guide-bars.

Quadrants **17** pivoted on a shaft **18** carry rollers **19** which ride on their respective pattern chains **16**. The other ends of the quadrants carry presser rods **20** with set screws **21** in the ends thereof, which bear against the guide-bars **22**. The guide-bars **22** are held against the set screws by spiral springs **23**.

The pattern chain **16** is shown in detail in Figures 2 and 3. Each pattern chain comprises links **24** united by shafts **25**; the links comprise bifurcated elements **26** which straddle unitary elements **27** of the next link, the shafts **25** passing through openings provided in the links. The links are of varying heights, as shown in Figures 2 and 3, so that the roller **19**, as it rides over the chain, moves up and down depending on the link height, and pushes its guide-bar **22** back and forth across the machine. The links in the pattern chain are numbered according to their height to correspond to wales in the fabric and the particular heights selected will depend on the threading of the machine and the pattern arrangements.

During a single course, if a stitch is to be knit, the guide-bar must pass from one wale to another for the needle to catch the thread to produce a stitch—if it remains in a single wale, the thread is not knit into the fabric, but is merely laid in or floated free of the fabric. The guide-bar may pass across a plurality of wales in the intervals between knitting the courses. In the case of the embroidery threads knit into the fabric according to the instant invention, these passages are so long that smooth camming action would not be possible in ordinary operation of the machine. According to this invention, the pattern drum **13** is speeded up by changing the gear **11**, so that instead of the conventional three links per course of the chain (2 to stitch, 1 to pass), any desired number of links may be used, so that smooth camming action is obtained even on long throws heretofore not possible without damage to the machine.

In reciting the pattern chain linkage used to make the patterns shown herein as illustrative of the invention, the pattern chain is described in terms of the linkages effective at the time of knitting the course, and all the intermediate links are omitted, thus 5–6/1–0 means that the first course is knit with the guide-bar moving from wale 5 to 6, and the next course is knit with the guide-bar moving from wale 1 to 0; the intermediate links which are used on the pattern chain, to ease the camming action for the long throw, are not recited. A course designed as **11—11** means that the thread is not knit into the fabric during that course, but floats free.

It should be noted in reading the pattern chains of the examples that they are recited in conventional terms; the numbers represent wales running from left to right on the conventional face of the fabric for right hand machines, vice versa for left hand machines. Since, according to the present invention, the face of the fabric of the invention is made where the back is made on conventional fabrics, rising numbers actually represent throws to the left, rather than to the right, for right hand machines.

Figure 4 shows the details, much magnified, of the structure shown in Figure 5, showing the point where the elements **51** and **52** of Figure 5 are joined. The threads **41** on the back guide-bar and the threads **42** on the middle guide-bar are knit together in every wale across each course to form a square knit solid double threaded fabric. The embroidery threads **43**, it will be noted, are used in a group of two threads. They are knit into the fabric with the threads **41** and **42** on the first course, partially shown on the drawing, then are thrown across to the fifth wale to the right and knit into the fabric, in the next course (the first course fully shown), are thrown to the left 5 wales and knit, then are thrown to the left 4 wales and knit to complete the triangle **51** of Figure 5, again to the left 6 wales and knit to start the second triangle **52** shown in Figure 5, and then thrown right 6 wales and knit, left 6 wales and knit, and so forth.

Figures 5 and 6 show the face and back, respectively of a three bar fabric in which two bars are used to knit the base fabric and the front bar is used to provide the embroidered design, with the embroidery yarn being knit into the fabric between the embroidery design areas. A portion of this fabric is shown, magnified in size, in Figure 4. The fabric is illustrated knit from the top of the drawing down, with a left hand machine i.e., the larger numbers are to the right of smaller numbers.

Threading:

Back bars—75 denier dull acetate, solid.
Middle bar—40 denier nylon, solid.
Front bar—2 in—20 out, 150 denier bright rayon and repeat.

Note that the embroidery thread is both heavier and brighter than the fabric threads.

The guide-bar actions are as follows:

Back bar—2–3/1–0 and repeat.
Middle bar—1–0/1–2 and repeat.

This produces a very solid square knit cloth.

Front bar:

7–8/5–4/8–9/5–4/9–10/5–4/10–11/5–4/1–0/6–7/2–1/6–7/3–2/6–7/4–3/4–5/5–6/6–7/7–8/8–9/9–10/10–11/11–12/12–13/12–11/14–15/11–10/14–15/10–9/14–15/9–8/14–15/18–19/13–12/17–18/13–12/16–17/13–12/15–16/13–12/12–11/11–10/10–9/9–8/8–7/7–6/6–5/5–4 and repeat.

In the chain used for this fabric, 4 chain links are used per course, permitting the maximum throws of 6 wales used in this design without danger to the machine at normal high speed production levels.

Referring to Figure 5, it will be noted that a massive element **51** is knit, roughly a triangle, involving 7 course with throws up to 6 wales. A similar triangle **52**, but

inverted, is then produced. The threads are then knit into the fabric to produce a diagonal line **53**; a second pair of triangles **54—55** is knit, and the embroidery threads are knit into the fabric to form a line **56** which runs to a point where the design is repeated.

Referring to Figure 6, it will be noted that the triangles appear as open angles 6—1, 6—2, 6—4 and 6—5, corresponding to the edges of the triangles **51**, **52**, **54** and **55**, while the lines **63** and **64**, corresponding to lines **53** and **56**, appear in full, indicating the points at which the embroidery threads are knit into the fabric between massive design elements.

Figure 7 shows another illustration of the invention, with a single bar background fabric embroidered and reinforced by threads from two embroidery guide bars. The fabric is illustrated knit from the top down, with a right hand numbering e.g., larger numbers are to the left of smaller numbers.

The back guide-bar, which knits the fabric, is threaded 1–150 denier gold rayon; 29–15 denier nylon, and repeat.

The embroidery bars are threaded:

Middle—4 out, 2–150 denier pink rayon/24 out, and repeat.

Front—2–150 denier pink rayon/28 out, and repeat.

The chain for the back guide-bar is set up as follows.

Back:

1–0/2–3/1–0/2–3/1–0/2–3/1–0/2–3/1–0/2–3/1–0/2–3/1–0/2–3/1–0/2–3/1–0/2–3/1–0/2–3/1–0/2–3/1–0/2–3/1–0/2–3/1–0/ 1–2/2–3/3–4/4–5/5–6/6–7/7–8/8–9/9–10/10–11/11–12/12–13/13–14/14–15/15–16/16–17/16–15/15–14/14–13/13–12/12–11/11–10/10–9/9–8/8–7/7–6/6–5/5–4/4–3/3–2/2–1 and repeat.

It will be noted that this produces a single bar fabric, first a heavy knit portion (**72**) for 21 of the 52 courses in the pattern repeat, then a thinner portion (**73**) running first to the left and then to the right. The yellow thread provides the center (**74**) of the rosette (**75**) formed by the embroidery threads.

The middle pattern chain is set up to operate the guide-bar as follows.

Middle:

5–6/1–0/5–6/1–0/5–6/1–0/5–6/3–2/7–8/3–2/7–8/3–2/7–8/3–2/7–8/5–6/1–0/5–6/1–0/5–6/1–0/1–2/2–3/3–4/4–5/5–6/6–7/7–8/8–9/9–10/10–11/11–12/12–13/13–14/14–15/15–16/16–17/16–15/15–14/14–13/13–12/12–11/11–10/10–9/9–8/8–7/7–6/6–5/5–4/4–3/3–2/2–1 and repeat.

This guide-bar provides the left half of the outside of the embroidered rosettes (**75**) and the pink knitted stripe (**76**) running to the left and then to the right, to form half of the diamonds (**77**) knit into and reinforcing the diagonal portions (**73**), (**73**) of the base fabric. The two pink threads coincide with the yellow thread in the diamond and hide it.

The front guide bar operates with the following movements.

Front:

16–17/12–11/16–17/12–11/16–17/12–11/16–17/12–11/14–15/10–9/14–15/10–9/14–15/10–9/14–15/12–11/16–17/12–11/16–17/12–11/16–17/16–15/15–14/14–13/13–12/12–11/11–10/10–9/9–8/8–7/7–6/6–5/5–4/4–3/3–2/2–1/1–0/1–2/2–3/3–4/4–5/5–6/6–7/7–8/8–9/9–10/10–11/11–12/12–13/13–14/14–15/15–16 and repeat.

The threads on this guide-bar complete the embroidered rosette, and form the pink knitted stripe, going right and then left, which completes the knitted diamonds **77**.

Figure 8 shows how the pattern on Figure 5 can be used to produce a different effect merely by changing the materials and threading.

Threading:

Back bar—15 denier nylon, solid.

Middle bar—15 denier nylon, solid.

Front bar—150 denier rayon, 2 in—10 out (8 times)/63 out, and repeat.

Guide-bar actions are as follows:

Back bar—1–0/1–2 and repeat.

Middle bar—1–2/1–0 and repeat.

Front bar—as in Figure 5.

This is a sheer fabric; this, and the varied manner of spacing of the lines **81** as compared with regular spacing of the design elements of Figure 5, make the fabric look completely different from Figure 5.

Figure 9 shows another variation obtainable with the embroidery action of Figure 5.

Threading:

Back bar—15 denier nylon, solid.

Middle bar—15 denier nylon, 11 in—11 out.

Front bar—150 denier rayon, 2 in—20 out.

Guide-bar actions:

Back bar—1–0/1–2 and repeat.

Middle bar—1–2/1–0 and repeat.

Front—as in Figure 5.

Note that the guide-bar action is identical for all bars with Figure 8, but the threading varies so that the appearance of the two fabrics is radically different, the first fabric being a solid background with variable embroidery designs, the second being a striped base fabric with the net stripe **92** carrying a regular embroidery stripe **91**.

This pattern illustrates one major advantage of the instant invention compared with standard methods of embroidering fabrics. Note how precisely the embroidery pattern follows the pattern of the base fabric; it is tied to it by the very process of making it. Such matching is impossible where the embroidery is applied after the fabric is knit, because it is impossible to lay the fabric in the embroidery machine in precise register.

Figure 10 shows a skewed diamond design obtainable, according to this invention, by floating the embroidery threads over the fabric between the massive embroidery designs. The pattern is illustrated as knit up the fabric, with a right hand machine (larger numbers go to the left).

Threading:

Back and middle bars—15 denier nylon, solid.

Front bar—4 in—20 out, 150 denier rayon and repeat.

Guide-bar actions:

Back bar—1–0/1–2/ and repeat.

Middle bar—1–2/1–0/ and repeat.

Front bar—1–0/2–2/3–3/4–4/5–5/6–7/8–8/9–9/10–10/11–11/11–12/14–15/10–9/14–15/10–9/14–15/10–9/12–13/14–14/14–14/16–16/17–17/17–18/19–19/19–19/20–20/20–20/21–22/24–25/20–19/24–25/20–19/24–25/20–19/24–25/17–16/9–8/ and repeat.

It will be noted that the embroidery threads are thrown up the fabric, as shown in the drawing, to form the line **104**, are tied down, are thrown up again, and the massive element **103** is formed by knitting a group of six courses with a throw of five wales. The threads are then floated up to form the line **102**; the massive element **101** is knit in six courses over a five wale throw, and the embroidery threads are then thrown to the right in eight wale throws to the starting point, to form the line **100**. In making this design, it is preferred to use six chain links for each course.

Figure 11 shows a pattern designed as an embroidered polka dot, before clipping. The pattern is symmetrical, so that the guide-bar action is the same for a right or left hand machine.

Threading:

Back bar—15 denier nylon, solid.
Middle bar—15 denier nylon, solid.
Front bar—150 denier bright rayon, 3 in—35 out and repeat.

Guide-bar actions:

Back bar—1–0/1–2/ and repeat.
Middle bar—1–2/1–0/ and repeat.
Front bar—3–4/2–1/4–5/1–0/5–6/1–0/5–6/1–0/ 4–5/2–1/4–5/4–3/6–6/9–9/12–12/15–15/ 18–18/22–21/23–24/21–20/24–25/20–19/ 24–25/20–19/24–25/21–20/23–24/22–21 22–23/18–18/15–15/12–12/9–9/6–6/ and repeat.

Note that the dots **111** are first made, starting with a throw over only two wales, going to a maximum of five, and finally down to one. The embroidery threads are then floated down and across free of the fabric, over 19 wales during six courses, before being tacked down again; another polka dot is made, and the threads refloated to start again. The floats **112** may be clipped off to leave a fabric with embroidered polka dots thereon.

Figure 12 shows a fabric with an embroidered zigzag stripe thereon. The pattern, as in Figure 11, is symmetrical.

Threading:

Back bar—15 denier nylon, solid.
Middle bar—15 denier nylon, solid.
Front bar — 5–6/1–0/5–6/2–1/6–7/3–2/7–8/4–3/ out, and repeat.

Guide-bar action:

Backbar—1–0/1–2/ and repeat.
Middle bar—1–2/1–0/ and repeat.
Front bar — 5–6/1–0/5–6/2–1/6–7/3–2/7–8/4–3/ 8–9/5–4/9–10/6–5/10–11/7–6/11–12/8–7/12– 13/9–8/13–14/10–9/14–15/11–10/15–16/12– 11/16–17/12–11/16–17/12–11/16–17/12–11/ 15–16/11–10/14–15/10–9/13–14/9–8/12–13/ 8–7/11–12/7–6/10–11/6–5/9–10/5–4/8–9/4–3/ 7–8/3–2/6–7/2–1/5–6/1–0/ and repeat.

Note that at the end of each break in direction of the line **121**, a square section **122** is knit.

Obviously, the fabrics disclosed can be varied widely in design without departing from the scope of the invention.

As indicated in the examples, in producing the base fabric, the threadings and guide-bar action can be widely varied to produce various forms of base fabric. While one and two bar fabrics have been shown, fabrics made on more bars can also be used.

Similarly, the threadings, guide bar actions and number of guide bars used for the embroidery threads may be varied as desired to produce the desired effect; a design may be produced by a single guide-bar, or by using different guide-bars to produce different parts of the design. For each portion of an embroidery design produced by a single guide-bar, there is obtained a design which is knit into the fabric at one edge of the design in one course, at the other edge of the design in the other course, and at alternate edges of the design for succeeding courses until the design is complete, with the threads free of the fabric between the knit-in edges of the design, to produce a design covering a substantial number of wales over a substantial number of courses.

It will be noted that in operating the machine, the threading for embroidery involves a few threads in, and a larger number out. In general, the embroidery threads may be set in groups of 1 to 5, although more may be used for special effects, and are kept below 25% of the total available threading. The operation of the machine is characterized by relatively large throws of the embroidery guide-bars as compared with the fabric knitting bars, with the threads kept free of the fabric over the throw. In effective massive embroidery designs, there will be throws of five or more wales somewhere in the design; and in producing such throws, the pattern drum is operated at speeds which will permit at least four chain elements per course to permit camming of the guide bar positioning elements without shaking of the knitting machine at conventional production speeds.

What is claimed is:

1. A warp-knit tricot fabric comprising a base fabric knit from warp threads, and carrying an embroidery design comprising massive design elements widely spaced from each other across the width of the fabric, each massive design element consisting of warp embroidery threads substantially heavier than the threads forming the base fabric, carried over at least several wales for several courses in closely adjacent throws, each embroidery thread being knit into the fabric at a side margin of the element and otherwise free of the fabric in that course, being thrown across the element free of the fabric from one side margin to the other, and then knit into the opposite side margin of the element in a succeeding course, and thrown in similar fashion at least several times across the element, back and forth over at least several wales, the embroidery thread being knit into an alternate margin of the element in a succeeding course after each throw, whereby each embroidery thread in the element is arranged zig-zag in alternately roughly parallel closely adjacent throws and each element comprises embroidery threads knit into the sides of the element only and free of the fabric between the sides of the element.

2. The fabric of claim 1, in which the embroidery threads are knit into the fabric between design elements.

3. The fabric of claim 1, in which the embroidery threads are floated free of the fabric between design elements.

4. The fabric of claim 1, in which the embroidery threads are of contrasting surface appearance to the base fabric threads.

5. The fabric of claim 1, in which the embroidery threads occupy less than 25% of the wales across the width of the fabric.

6. The fabric of claim 1, in which the embroidery threads occupy less than 25% of the wales across the width of the fabric, and are arranged in groups of 1 to 5 threads.

7. The fabric of claim 1, in which the embroidery threads occupy less than 25% of the wales across the width of the fabric, are arranged in groups of 1 to 5 threads, and in which the massive design elements contain at least one throw of at least five wales.

8. The fabric of claim 1, in which a plurality of massive design elements are positioned adjacent each other on the fabric, to produce a composite design, the composite design elements being widely spaced from each other across the width of the fabric.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,888,815 June 2, 1959

Arnold Jacoby et al

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 22, beginning with "next course," strike out all to and including "the fabric" in line 24; line 50, for "eclor" read -- color --; column 7, lines 29 and 30, should read as shown below instead of as in the patent:

Front bar—150 denier spun dyed rayon,
5 in—27 out, and repeat.

Signed and sealed this 6th day of October 1959.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents