METHOD OF KNITTING PATTERNED FABRIC

INVENTOR.

NATHAN LEVIN

ATTORNEY
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Nathan Levin, Trenton, N.J., assignor to Textile Machine Works, Wyomissing, Pa., a corporation of Pennsylvania

Application July 17, 1956, Serial No. 598,298

7 Claims. (Cl. 66—43)

The present invention relates generally to the art of knitting and more particularly to weft knit fabric composed of suture joined pairs or portions of fabric having an overlaid design incorporated therein and to the method of making the same.

In an application Serial No. 584,932, filed May 15, 1956, of which the present application may be considered a continuation-in-part, a method of knitting an overlaid design in suture joined areas of a tubular fabric is disclosed, the method generally providing for the operation of a four feed circular knitting machine in such manner that an opposite pair of feeds (also known as knitting stations) forms a corresponding first pair of fabric areas oppositely disposed in the circular fabric while the intervening pair of feeds incorporates the overlaid design within the said first pair of fabric areas during the knitting thereof, and then reversing the action of each of the pairs of feeds for the formation of a second pair of overlaid-ornamented oppositely disposed fabric areas, the fabric areas of said first and second pairs and of other similar pairs thereof being arranged in alternation to form said tubular fabric.

In the above method, a pair of overlaid yarns is individually associated with each of the feeds with the result that the overall overlaid design in the tubular fabric is made up of a series of eight individual yarns, portions of which float walewise within the tubular fabric between certain of the fabric areas.

It is an object of the present invention to provide a tubular weft knit fabric, which may comprise the leg portion of a stocking, having a plural section pattern composed of a plurality of suture joined fabric areas having an overlaid design wherein the design is formed of overlaid yarns of which individual ones thereof are knit in adjoining fabric areas of adjoining pattern sections on both sides of the common suture therebetween, and to provide a method of knitting the same.

It is also an object of the present invention to provide a weft knit fabric having a plural section pattern composed of a plurality of suture joined fabric areas having an overlaid design wherein the design is formed of overlaid yarns of which individual ones thereof are knit in adjoining fabric areas of adjoining pattern sections on both sides of the common suture therebetween, and to provide a method of making the same.

It is a further object of the present invention to provide a method of operation for a four feed circular knitting machine by reciprocation thereof, to knit an overlaid design in suture joined areas of a tubular fabric, wherein an opposite pair of feeds forms a corresponding first pair of fabric areas oppositely disposed in the tubular fabric in oppositely disposed pattern sections while at each of the intervening pair of feeds a pair of overlaid yarns is employed in incorporating the overlaid design within the said first pair of fabric areas during the knitting thereof, and then reversing the action of each of the pairs of feeds for the formation of an overlaid-ornamented oppositely disposed fabric areas, the said pairs of overlaid yarns now being incorporated in the second pair of fabric areas at the first named opposite pair of feeds, these method steps being repeated to form other first and second pairs of fabric areas all of which are overlaid-ornamented with the said pairs of overlaid yarns, the fabric areas of the said first and second pairs thereof being arranged in alternation and suture joined to form said tubular fabric.

With these and other objects in view which will become apparent from the following detailed description of the illustrative embodiment of the invention shown in the accompanying drawings, the invention resides in the novel features of the present method of knitting and in the product resulting therefrom, as hereinafter more particularly pointed out in the claims.

In the drawing:

Fig. 1 is a view of one side of a solid color stocking of the Argyle type having an overlaid design of the present invention incorporated therein;

Fig. 2 is a partial view of the opposite side of the stocking shown in Fig. 1;

Fig. 3 is a view illustrating a step in the method of knitting, of the present invention, upon a four feed circular knitting machine, the needle circle being indicated by a dot and dash line and

Fig. 4 is a view similar to Fig. 3 illustrating another step in the method of knitting.

The overlaid design is preferably incorporated in circular knit hosiery and is preferably made upon a multifeed machine of the type disclosed in the application of Benjamin Franklin Coyle, Serial No. 329,801, filed January 6, 1953, to which reference may be made.

In the machine of the Coyle application, hosiery of the Argyle or Intarsia type having solid color, suture joined, four-section patterns may be knit by more than one method. One method includes the formation of a complete course, containing suture joined partial courses of each of the four pattern sections, on the four feeds during each stroke of the machine. In a second method, a machine may be operated to knit an opposite pair of partial courses of each of a first pair of opposite pattern sections, fabric areas on courses of eight individual yarns, portions of which float walewise between the tubular fabric between certain of the fabric areas.

In the present method, known as the fill-in system, the said first pair of opposite fabric areas is completed by their associated pair of feeds, after which the said pair of feeds is made inactive and the previously inactive pair offeeds is made active to knit the inbetween second pair of fabric areas. For example, in the case of diamond shaped areas of an Argyle pattern, the feeds Nos. 1 and 3 may knit an opposite pair of diamonds in an opposite pair of pattern sections with feeds Nos. 2 and 4 inactive, after which the feeds Nos. 2 and 4 may be activated to knit and fill-in an inbetween pair of diamonds in the intervening pair of pattern sections with feeds Nos. 1 and 3 inactive, and then these steps may be repeated. It will be understood that the contiguous diamonds are suture joined along their outline lines as the held loops thereof on needles progressively retired during the knitting of any one pair of diamonds are knitted when the retired needles are progressively made active during knitting of the other pair of diamonds.

The fill-in system is not limited to the formation of diamond shaped areas but may be used for solid color areas of other configurations. It is with the fill-in system of solid color knitting that the application Serial No. 584,932 and the present application are related, in connection with the incorporation of an overlaid design.

As illustrated in Figures 1 and 2, the stocking includes a top 10, a leg portion 11, and the usual foot portion 12. The leg portion is provided with a four section diamond shaped Argyle pattern of which there are the upper opposite pair of side half diamonds 13 and 14; the in-
The intermediate opposite pair of side diamonds 15 and 16; the lower opposite pair of side half diamonds 17 and 18; the front and rear upper pair of diamonds 19 and 20; and the front and rear lower pair of diamonds 21 and 22. The various diamonds are joined along diagonally extending suture lines indicated at 23. The diamonds themselves, each of a solid color, are ornamented with an overplaid design comprising relatively narrow lines or stitches of contrasting colored yarns, the overplaid design generally dividing each diamond into a group of four smaller diamonds. The diamond areas 13, 15 and 17 and the diamond areas 14, 16 and 18, are formed in an opposite pair of pattern sections while the diamond areas 19 and 21 and the diamond areas 20 and 22 are formed in the intervening pair of pattern sections. It will be noted that there are a number of wales common to adjacent pattern sections.

The diamond shaped areas on the side of the stocking shown in Figure 1 are provided with an overplaid design knit of overplaid yarns a and b which start to knit generally at the center of the widest course of half diamond 13 and, as the knitting continues, diverge to an angle to the wales to meet the mid-points of their lower suture lines 23 (which are also the mid-points of the upper suture lines 23 of diamonds 19 and 20) about half way down the half diamond 13, then continue to knit along the same converging lines in the diamonds 19 and 20 to about the centers thereof after which they are knit along converging lines to meet the mid-points of the lower suture lines 23 of these diamonds 19 and 20 which are also the mid-points of the upper suture lines 23 of diamonds 21 and 22, then continue to knit along the same converging lines in the diamonds 21 and 22 to the centers thereof after which they are knit along converging lines to meet the mid-points of the lower suture lines 23 of these diamonds 21 and 22 which are also the mid-points of the upper suture lines 23 of the lower half diamond 17) and then continue to knit along the same converging lines in the half diamond 17 to meet the mid-point of the center of its widest course, after which knitting of the overplaid yarns a and b ceases and the terminal ends thereof float inside the stocking, as indicated by the dotted lines, the beginning ends of these yarns also being indicated by dotted lines.

In a similar manner the diamond shaped areas on the side of the stocking shown in Fig. 2 are provided with an overplaid design knit of overplaid yarns c and d incorporated therein during the knitting of these diamonds. It should be noted that the lines knit of the yarns b and c meet generally at the centers of diamonds 19 and 21, and that the lines knit of the yarns a and b meet generally at the centers of diamonds 20 and 22.

The particular location of the overplaid design shown in the drawing is by way of example only and it may be placed in other portions of the diamonds, also, the design itself may be varied, and, in one form or another, may be used in combination with suture joined fabric areas of other configurations.

Generally in the method of knitting set forth in application Serial No. 584,932, the side half diamonds 13 and 14, the side full diamonds 15 and 16, and the side half diamonds 17 and 18, are knit at feeds Nos. 2 and 4 of suitable body yarns, while the overplaid design is incorporated in these diamonds at the feeds Nos. 1 and 3 by using a pair of overplaid yarns at and individual to each of the latter feeds. The front and rear diamonds 19, 20, 21 and 22 are knit at feeds Nos. 1 and 3 of suitable body yarns, while the overplaid design is incorporated in these diamonds at feeds Nos. 2 and 4 by using another pair of overplaid yarns at and individual to each of the latter feeds. The overplaid yarns thus float walewise inside the fabric between the diamonds within which they are incorporated since the knit lines of the overplaid yarns do not extend into adjoining fabric areas.

According to the method of knitting of the present invention, the opposite side half diamonds 13 and 14, the opposite side half diamonds 17 and 18, and the opposite full diamonds 15 and 16, are knit at feeds Nos. 2 and 4 of suitable body yarns and at feeds Nos. 1 and 3 of suitable body yarns 25 and 27 (according to the diagrammatic arrangement of Fig. 3) while at the same time the overplaid yarns, b and c at feed Nos. 1 and a and d at feed No. 3, are incorporated therein at the latter two feeds, generally after the manner set forth in application Serial No. 584,932. The front and rear diamonds 19, 20, 21 and 22 are knit at feeds Nos. 1 and 3, of suitable body yarns 26 and 27 (according to the diagrammatic arrangement of Fig. 4) while at the same time the overplaid yarns, a and b at feed Nos. 2 and c and d at feed No. 4, are incorporated therein at the latter two feeds, also generally after the manner set forth in the application Serial No. 584,932, but differing therefrom in that the same overplaid yarns previously fed at feeds Nos. 1 and 3 are now fed at feeds Nos. 2 and 4. It should be noted that the overplaid yarns are arranged in a particular manner at the various feeds, one of each pair thereof being moved from any one feed to the feed nearest thereto to provide the pair of overplaid yarns therewith. The yarns a and b at the feeds Nos. 1 and 3 to provide the pair of yarns for feed No. 2 while the yarns c and d are moved from the feeds Nos. 1 and 3 to provide the pair of yarns for feed No. 4. The overplaid yarns are moved back and forth between the feeds to provide the arrangements of Figs. 3 and 4, as required for the knitting of the various pairs of diamonds as the knitting continues to form the full complement of diamond shaped areas required for the tubular fabric. The body yarns may be changed as to color as desired so that the various diamonds may be contrastingly colored. The overplaid yarns, which may also be contrastingly colored, may each be moved back and forth between an adjacent pair of feeds by any suitable means, for example, by a movable yarn feeding finger which is suitably pivoted to swing to feeding positions, under pattern control, at and between each pair of adjacent feeds.

The yarns a and b, after knitting in the half diamond 13, continue to knit, successively, in the diamonds 15, 17, 19, 21, 20, and 22, and the half diamond 17, and the yarns c and d likewise, after knitting in the half diamond 14, continue to knit, successively, in the diamonds 15 and 16, 18, 20, 21, 22, and the half diamond 16. Thus vertical interior floats of the overplaid yarns (which were subject to a trimming operation) between diamonds are avoided and the overplaid design is formed of a lesser number of yarns to provide a neater and generally more attractive appearance to the interior of the stocking which is thus free of unsightly cut ends of overplaid yarns.

Furthermore, a stronger and better stitch construction is provided by combining the knitting of the overplaid design across the suture lines by the same yarns, for this avoids the possibility of holes or weak points in the fabric at the places where, previously, the stitches of each separate overplaid yarn either terminated or began at or near the suture lines. It will be noted that each of the overplaid yarns is knit in the fabric areas of an adjacent pair of pattern sections, and, while each yarn is shown in the various common to both pattern sections, the overplaid yarns may also be knit in other wales of these pattern sections.

Having thus described my invention in full detail, it will be understood that these details need not be strictly adhered to and that various changes and modifications may be made all falling within the scope of the invention as defined by the following claims.
I claim:

1. A method of knitting on a circular knitting machine having four knitting stations and adapted to reciprocate to knit at said stations, including the step of reciprocatorily knitting a yarn at each of a first opposed pair of said stations to simultaneously form a first opposed pair of fabric areas, the step of reciprocatorily knitting a pair of yarns at each of the remaining opposed pair of knitting stations to form an overplaid design of said pairs of yarns in said first opposed pair of fabric areas during the knitting thereof, and the step of changing the operation of the opposed pairs of knitting stations to simultaneously form a second opposed pair of fabric areas at said remaining opposed pair of stations having an overplaid design formed therein of said pairs of yarns at said first opposed pair of knitting stations.

2. A method of knitting on a circular knitting machine having four knitting stations and adapted to reciprocate to knit at said stations, including the step of reciprocatorily knitting a yarn at each of a first opposed pair of said stations to simultaneously form a first opposed pair of fabric areas, the step of reciprocatorily knitting a first and a second pair of yarns at the first and at the second of the remaining opposed pair of stations, respectively, to form an overplaid design of said pairs of yarns in said first opposed pair of fabric areas during the knitting thereof, the step of reciprocatorily knitting a yarn at each of said remaining opposed pair of knitting stations to simultaneously form a second pair of fabric areas, and the step of reciprocatorily knitting one of said first and one of said second pairs of yarns at each of said first opposed pair of knitting stations to form an overplaid design of said pairs of yarns in said second pair of fabric areas during the knitting thereof.

3. A method as set forth in claim 2 including the additional step of repeating the knitting action of the pairs of knitting stations to simultaneously form additional pairs of correspondingly similar fabric areas.

4. A method as set forth in claim 2 including the step of repeating the knitting action of the pairs of knitting stations to simultaneously form additional pairs of correspondingly similar fabric areas, and the step of suture-joining the terminal edges of the fabric areas, during the knitting thereof.

5. A method of knitting on a circular knitting machine having four knitting stations and adapted to reciprocate to knit a tubular fabric at said stations, including the step of reciprocatorily knitting a yarn at each of an opposite pair of said stations to simultaneously form a first pair of oppositely disposed fabric areas, the step of reciprocatorily knitting a pair of yarns at each of the intervening pair of knitting stations to form an overplaid design of said pairs of yarns in said first pair of fabric areas during the knitting thereof, and the step of changing the knitting action of the pairs of knitting stations to simultaneously form a second pair of oppositely disposed fabric areas arranged in circumferential alternation in relation to the first named fabric areas to form said tubular fabric and having an overplaid design therein of said pairs of yarns.

6. A method of knitting on a circular knitting machine having four knitting stations and adapted to reciprocate to knit a tubular fabric at said stations, including the step of reciprocatorily knitting a yarn at each of an opposite pair of said stations to simultaneously form a first pair of oppositely disposed fabric areas, the step of reciprocatorily knitting a first and a second pair of yarns at the first and at the second of the intervening pair of knitting stations, respectively, to form an overplaid design of said pairs of yarns in said first pair of fabric areas during the knitting thereof, the step of reciprocatorily knitting a yarn at each of said intervening pair of knitting stations to simultaneously form a second pair of oppositely disposed fabric areas arranged in circumferential alternation with and suture joined to the first named fabric areas to form said tubular fabric, and the step of reciprocatorily knitting one of said first and one of said second pairs of yarns at each of said opposite pair of knitting stations to form an overplaid design of said pairs of yarns in said second pair of fabric areas during the knitting thereof.

7. A method of knitting on a circular knitting machine having four knitting stations and adapted to reciprocate to knit at said stations, including the step of reciprocatorily knitting a yarn at each of an opposite pair of said knitting stations to simultaneously form a first pair of oppositely disposed fabric areas, the step of reciprocatorily knitting a pair of circumferentially spaced yarns at each of the intervening pair of knitting stations to form an overplaid design of said pairs of yarns in said first pair of fabric areas during the knitting thereof, the step of moving one of each of said pairs of circumferentially spaced yarns to the next knitting station nearest thereto to provide a pair of circumferentially spaced yarns at each of said opposite pair of knitting stations, the step of reciprocatorily knitting a yarn at each of said intervening pair of knitting stations to simultaneously form a second pair of oppositely disposed fabric areas arranged in circumferential alternation with the first named fabric areas, and the step of reciprocatorily knitting the said provided pairs of circumferentially spaced yarns at said opposite pair of knitting stations to form an overplaid design in said second pair of fabric areas during the knitting thereof.

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