

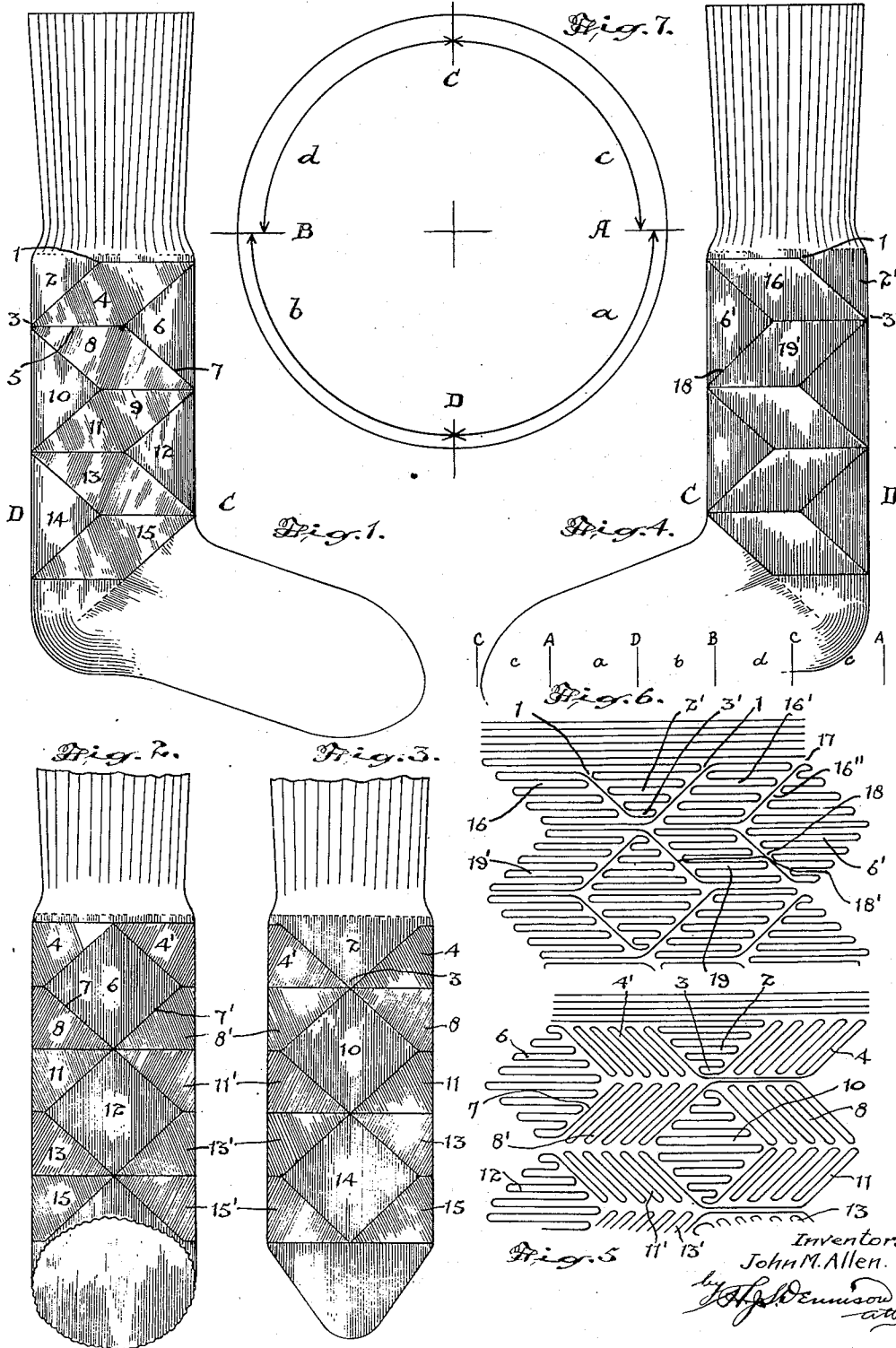
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HOSIERY AND METHOD OF MANUFACTURE

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HOSIERY AND METHOD OF MANUFACTURE

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This invention relates to knitted articles and more particularly to the manufacture of hosiery, and the principal objects of the invention are to provide a sock or the like which will be of a distinctive type and which will be capable of economic manufacture under automatic control.

The principal feature of the invention resides in the novel manner of fabricating a sock or the like with a series of substantially diamond-shaped areas inter-knit with substantially parallelogram-shaped areas extending in a zig-zag manner longitudinally of at least the ankle portion of a sock.

In the drawing Figure 1 is a side elevational view showing a sock fabricated in accordance with a preferred form of the present invention.

Figure 2 is a front elevational view of the sock shown in Figure 1.

Figure 3 is a rear elevational view.

Figure 4 is a side elevational view of a sock incorporating a modification of the present invention.

Figure 5 is a diagrammatic view illustrating a preferred relation between the courses of the diamond-knit areas and intervening areas.

Figure 6 is a view similar to Figure 5 illustrating a modified arrangement of the courses connecting the diamond-knit areas.

Figure 7 is a diagrammatic plan representative of a cylindrical knitting machine.

In the application of the present invention to the knitting of the sock shown in Figures 1, 2 and 3, the upper portion from the commencement to the point *f* may be knit in any desired or well known manner, and in the following definition of steps in the knitting it will be assumed that the article being knitted passes downwardly within the cylinder in inverted form to that in which it is shown. When the point *f* is reached substantially half of the full complement of needles, that is, from A to B representing the groups of needles *c* and *d*, are raised out of action.

Knitting then continues with the groups of needles *a* and *b* picking up one or more of the end needles during the successive courses until only one or more needles in the vicinity of D are in operation, thereby forming the triangular or semi-diamond area 2.

From the apex 3 a course is then knit along one tapering edge of the portion 2 to the point *f*, bringing into action the group of needles *b* representing substantially one quarter of the full complement of needles and a suitable yarn change may be made and knitting then proceeds by progressively picking up one or more of the

needles *b* from D to B out of action in the succeeding courses, while progressively bringing down into action a corresponding group of needles *d* from B to C, thereby knitting in a parallelogram-shaped area 4. Thus the commencement of knitting of the section 4 takes place on the group of needles *b*, while the last course is knit on the group of needles *d*.

The group of needles *d* are then raised out of action while the group *b* are brought simultaneously into action to knit a course along the tapered edge 5 of the area 4 to the point 3 and the group of needles *a* are dropped into action while the group *b* is again raised from action, and knitting is continued on the group *a* to knit courses parallel with the remaining tapered edge of the triangular portion 2 and one or more needles of group *a* are picked up between D and A, while a corresponding number of needles are brought down into action of the group *c* from A to C, so that the last course of the area 4 is knit with substantially all of the needles *c* and a yarn change may be made in such course.

All of the needles are then raised out of action, with the exception of one or more adjacent the point C, and knitting proceeds with a reciprocating action and each successive course is lengthened by bringing down into action one or more needles of the groups *c* and *d* in a balanced manner until substantially one-half the full complement of needles from A to B, including the groups *c* and *d*, are in action, and after which knitting continues by progressively removing from action the needles from A to C and B to C in the inverse order in which they were brought into action until only one or more needles in the zone C are in action, thereby forming the diamond-shaped area 6.

The group of needles *d* from C to B is then dropped into action to knit a course 7 along the tapered edge of the zone 6 and the knitting continues by progressively picking up the needles *d* from C to B one or more for each course and progressively dropping the group of needles *b* from B to D into action one or more to the course, so that when the parallelogram-shaped area 8 is completed in interknit relation to the areas 4 and 6, only the group of needles *b* will be in action.

The group of needles *d* are then simultaneously brought into action to knit a course along the tapered edge 9 of the area 8 and the entire needles of both groups *d* and *b* are then lifted out of action, while the group *c* is brought down into

action from C to A to knit a course along the tapering edge 7' of the diamond-shaped area 6.

Knitting then continues by progressively lifting one or more needles c out of action from C to A during the subsequent courses, while progressively returning to action the group of needles a one or more at a time from A to D, thereby knitting the parallelogram-shaped area 8'.

All the needles are then raised out of action with the exception of one or more in the zone D and knitting is then continued with a reciprocating action, progressively dropping needles of the groups a and b at the ends of the respective courses one or more at a time until both groups a and b are in action from A to B, and knitting then continues while the needles a and b are progressively raised out of action at the respective ends of the courses in substantially the inverse order in which they were dropped into action until only one or more needles in the zone D remain in action, thereby forming the diamond-shaped area 10 which is interknit with the tapering edges of the areas 8 and 8'.

The cycles of knitting are then repeated to first knit the parallelogram-shaped areas 11 and 11', then the diamond-shaped area 12, then the parallelogram-shaped areas 13 and 13' and finally the diamond-shaped area 14 and parallelogram-shaped areas 15 and 15'.

The pattern may be repeated as often as desired and may optionally extend into the foot and yarn changes may be made at any desired point so that desired colour combinations may be presented.

With the particular sequence of knitting operations defined it will be noted that the commencement course of each of the parallelogram-shaped areas extends along the sloping or tapered edge of a diamond or semi-diamond shaped area, and that the wales of the parallelogram-shaped areas not only extend in inclined or diagonal relation to the wales of the diamond-shaped areas, but are also in angular relation to the wales of the adjacent parallelogram-shaped areas, so that not only do the parallelogram-shaped areas themselves extend in a distinctive zig-zag pattern effect, but also the wales thereof, producing the effect of remarkable depth to the pattern, and providing enhanced resiliency and strain distribution.

While I have shown a more or less squared or diamond formation, this may be altered simply by reducing or increasing the number of needles brought into action or lifted from action at the ends of the respective courses, and it is desirable that uniformity in this respect be maintained throughout the knitting of the various areas, that is to say, should only one needle be dropped into action or raised from action during the knitting of the first area, the same procedure should be followed throughout the knitting of the various areas in order to obtain a balanced fabric.

In the modified form of the invention illustrated in Figures 4 and 6 the knitting of the zig-zag areas is carried out on the straight. This is accomplished by knitting a course from the point 3' or apex of the tapering or semi-diamond portion 2' along one tapering edge of the latter by bringing the group of needles a into action from D to A and continuing by bringing the group of needles c into action from A to C and raising the group a from action from D to A and knitting continues with a reciprocating action, progressively picking up the group of needles c out of

action one or more at a time for each course from C to A, while progressively returning the group of needles a into action from A to D in the respective courses until the point 3' is reached when only the group of needles a will be in action.

This group a is then raised out of action while the group b is brought down into action from D to B to knit a course along the other tapering edge of the portion 2', and the group of needles b are then raised from action and the group of needles d from B to C brought down into action. Knitting then continues by progressively raising from action the needles d from C to B one or more for each course, while the group of needles b are progressively returned to action one or more for each course from B to D.

There are thus formed mating parallelogram-shaped areas or segments 16 and 16' on opposite sides of the tapered portion 2'.

The group of needles b are then raised from action and the group of needles d returned to action from B to C to knit a course along the tapering edge 16'' of the area 16' until the point 17 is reached where all needles, with the exception of one or more in the zone C, are raised out of action.

Knitting then proceeds in the manner defined in connection with the diamond-shaped area 6 of Figure 1 by progressively picking up one or more needles of the groups c and d from C to A and C to B in the respective courses until both groups c and d are in action, after which the groups of needles c and d are progressively raised from action in substantially the inverse order in which they were dropped into action, thereby knitting in the square or diamond-shaped area 6'.

At the completion of knitting the area 6' one or more needles in the zone C may remain in operation and the group of needles d from C to B are then brought down into action to knit a course along the tapering edge 18 of the area 6', and the group of needles b are then brought down into action from B to D, while the group d is raised from action. Knitting then continues by progressively bringing into action the group of needles d from B to C, one or more for each course, and progressively raising from action the group of needles b from D to B, thereby knitting in the parallelogram-shaped area 19.

The group of needles b are then dropped into action from B to D, while the group d is raised from action and a course is knitted along the tapering edge 18' of the area 19 to the point 3', and the group of needles a are dropped into action from D to A and the group of needles b are raised out of action.

Knitting then continues on the group a by progressively raising these from action from D to A one or more for each course, while the group of needles c are progressively returned to action one or more for each course from A to C, thereby knitting in the mating parallelogram-shaped area 19'.

The group of needles c are then raised from action from C to A and a course is knit on the needles a from A to D until the point 3' is reached and all needles, with the exception of one or two in the zone D, are raised from action, and knitting then continues with a reciprocating action in the manner defined in connection with the diamond-shaped area 10 of Figure 1.

These cycles of knitting may then be repeated as often as may be desired until the heel and foot portion is reached, after which knitting may pro-

ceed in a manner which need not be specifically referred to herein.

In the form of knitting shown in Figures 4 and 6 the wales of the various segments, including the zig-zagged parallelogram-shaped areas, will all be substantially parallel.

It is also important to note that in connection with both of the illustrated forms of the invention the knitting of the various parallelogram-shaped area is accomplished by retaining in action a substantially uniform number of needles for each course and in the preferred form of the invention this represents substantially one-quarter of the full complement of needles.

I am aware that minor changes may be made either in the sequence or nature of the steps exemplified herein within the spirit of the present invention and in certain cases I may, if desired, alternate the nature of the respective zig-zag or parallelogram-shaped areas either as to colour, character or angular relation of the wales.

While I have shown and described the present invention in connection with hosiery, it is not to be restricted in this regard. The invention is also capable of being carried out by knitting machines of other than the circular or cylinder type and a very desirable product is produced, and it is to be particularly noted in connection with the construction illustrated in Figure 1 that the angular disposition of the wales relative to the intervening areas will impart an enhanced resiliency to the product and will serve to effectively distribute strains.

What I claim as my invention is:

1. Hosiery having substantially squared areas and rhomboid shaped areas knit therebetween in zig-zag relation in separating relation to the squared areas.

2. A tubular article knit with square areas disposed in circumferentially spaced rows in diagonal progression, and connected solely by rhomboid areas knit therebetween.

3. A tubular article knit with squared areas disposed in circumferentially spaced rows in diagonal progression longitudinally of the article, the squared areas of one row being offset from the squared areas of an adjacent row in the longitudinal direction of the article a distance substantially equal to one half the diagonal depth of the squared areas, and a series of rhomboid areas interknit between the adjacent sides of the rows of squared areas.

4. A tubular article knit with squared areas disposed in circumferentially spaced rows in diagonal progression longitudinally of the article, the squared areas of one row being offset from the squared areas of an adjacent row in the longitudinal direction of the article a distance substantially equal to one half the diagonal depth of the squared areas, and a series of rhomboid areas interknit between the adjacent sides of the rows of squared areas in zig-zag progression longitudinally of said tubular article.

5. A tubular article knit with squared areas disposed in circumferentially spaced rows in diagonal progression longitudinally of the article, the squared areas of one row being offset from the squared areas of an adjacent row in the longitudinal direction of the article a distance substantially equal to one half the diagonal depth of the squared areas, and a series of rhomboid areas interknit between the adjacent sides of the rows of squared areas in zig-zag progression longitudinally of said tubular article and having the

wales angularly disposed to the wales of said squared areas.

6. A tubular article knit with squared areas disposed in circumferentially spaced rows in diagonal progression longitudinally of the article, the squared areas of one row being offset from the squared areas of an adjacent row in the longitudinal direction of the article a distance substantially equal to one half the diagonal depth of the squared areas, and a series of rhomboid areas interknit between the adjacent sides of the rows of squared areas in zig-zag progression longitudinally of said tubular article, each of said rhomboid-shaped areas having its wales disposed in obtuse angular relation to the adjacent wale or wales and to the adjacent squared areas.

7. A tubular article knit with squared areas disposed in circumferentially spaced rows in diagonal progression longitudinally of the article, the squared areas of one row being offset from the squared areas of an adjacent row in the longitudinal direction of the article a distance substantially equal to one half the diagonal depth of the squared areas, and a series of rhomboid areas interknit between the adjacent sides of the rows of squared areas in zig-zag progression longitudinally of said tubular article, said rhomboid-shaped areas being interknit with the said squared areas with the wales of the alternate rhomboid-shaped areas only parallel with each other and angularly related to the wales of the intermediate rhomboid-shaped areas in the zig-zag series.

8. A knitted article having spaced squared areas and rhomboid-shaped areas interposed therebetween with the first course of the rhomboid area knit to one squared area and the last course knit to another of said spaced squared areas.

9. A knitted hose having a series of rhomboid-shaped areas arranged in zig-zag progression at opposite sides of at least the lower tubular leg portion and defining therebetween rows of diamond-shaped areas disposed in longitudinal diagonal progression.

10. Hosiery having a series of four rhomboid-shaped areas interknit with a single substantially diamond-shaped area and confined within the diagonal depth of the latter.

11. A method of knitting hosiery with tapered areas interknit with parallelogram-shaped areas comprising first knitting a tapered area, then knitting a course along a tapered edge of the tapered area of a predetermined number of loops, then knitting to said course a series of successive courses having substantially the same number of loops for each successive course while progressively eliminating and adding one or more loops at the ends of each successive course respectively to form a parallelogram-shaped area with wales angularly related to the wales of the adjacent tapered area, continuing the last course of knitting to extend along the free tapered edge of the parallelogram-shaped area, then knitting a course along the mating tapered edge of the first mentioned tapered area, then knitting to the last-mentioned course and following the progressive sequences used in the knitting of the first-mentioned parallelogram-shaped area to form a mating similarly knit area.

12. A method of knitting hosiery with tapered areas interknit with parallelogram-shaped areas comprising first knitting a tapered area, then knitting a course along a tapered edge of the tapered area of a predetermined number of

loops, then knitting to said course a series of successive courses having substantially the same number of loops for each successive course while progressively eliminating and adding one or more loops at the ends of each successive course respectively to form a parallelogram-shaped area with wales angularly related to the wales of the adjacent tapered area, continuing the last course of knitting to extend along the free tapered edge of the parallelogram-shaped area, then knitting a course along the mating tapered edge of the first-mentioned tapered area, then knitting to the last-mentioned course and following the progressive sequences used in the knitting of the first-mentioned parallelogram-shaped area to form a mating similarly knit area, continuing the last course of knitting of the last-mentioned parallelogram-shaped area to extend along the last knit edge thereof, then, commencing with one or more loops in a zone intermediately between the inclined edges of the respective parallelogram-shaped areas, knitting in a diamond-shaped area between the said parallelogram-shaped areas to connect with the last knit courses thereof.

13. A method of knitting hosiery with rhomboid-shaped areas comprising knitting the first course of a predetermined number of loops and knitting a series of successive courses thereto each of substantially the same number of loops at the end of one course and adding one or more loops at the other end of a succeeding course to thereby taper the respectively opposite ends of each rhomboid-shaped area in substantially uniform parallel relation.

14. A method of knitting hosiery with tapered areas interknit with rhomboid-shaped areas comprising first knitting a tapered area, then knitting a course along a tapered edge of the tapered area of a predetermined number of loops, then knitting to said course a series of successive courses each of substantially the same number of loops by successively eliminating and adding one or more loops at the end of each successive course respectively to uniformly taper opposite ends of each area and bring same into substantially parallel relation in the form of a rhomboid-shaped area with wales angularly related to the wales of the adjacent tapered area.

15. A method of knitting hosiery comprising first knitting in a progressively tapered portion, then knitting to one tapered edge thereof a par-

allelogram-shaped area formed of a plurality of successive courses each of a substantially similar number of loops and each offset from the preceding course a distance equivalent to one or more loops, then at a spaced zone knitting a second mating parallelogram-shaped area to the other tapered edge of said tapered portion, then knitting in a tapering portion between the adjacent edge portions of said parallelogram-shaped areas.

16. A tubular knit article embodying a series of parallelogram-shaped areas knit together in planes disposed perpendicular to the longitudinal axis of the article.

17. A knitted hose having a series of parallelogram-shaped areas interknit together in planes disposed perpendicular to the longitudinal dimension of the hose and having opposite parallel sides interknit with substantially squared areas.

18. A knitted hose having a series of parallelogram-shaped areas knit into at least the lower leg portion and knit together in parallel planes disposed perpendicularly of the longitudinal axis of the hose to extend in a zig-zag path longitudinally of at least one side of the said leg portion.

19. Hosiery having a series of four rhomboid-shaped areas interknit with a single substantially squared area.

20. Hosiery having parallelogram-shaped areas interknit with substantially squared areas, the combined width of two of the parallelogram-shaped areas in the longitudinal direction of the hose being equal to the diagonal depth of the squared area, the squared areas being offset from each other a distance equal to substantially one half of their diagonal depth and knitted to and separated by said parallelogram-shaped areas.

21. Hosiery having a series of four rhomboid-shaped areas interknit with a single substantially squared area, each of said series of rhomboid-shaped areas being knit with their wales in angular relation to the wales of the squared area.

22. Hosiery having a series of four rhomboid-shaped areas interknit with a single substantially squared area, each of said series of four rhomboid-shaped areas being knit with their wales in parallel relation to the wales of the squared area.

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