Aug. 22, 1939. E. C. LOCHHEAD 2,170,149

HOSIERY AND METHOD OF MAKING THE SAME

Filed Jan. 15, 1935

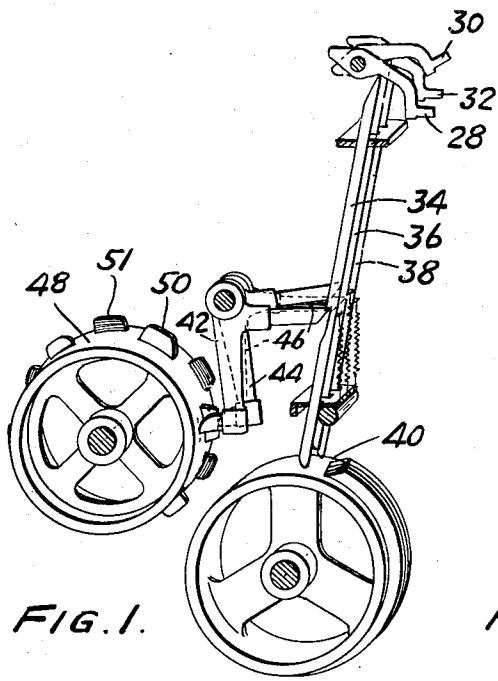

FIG. 1.

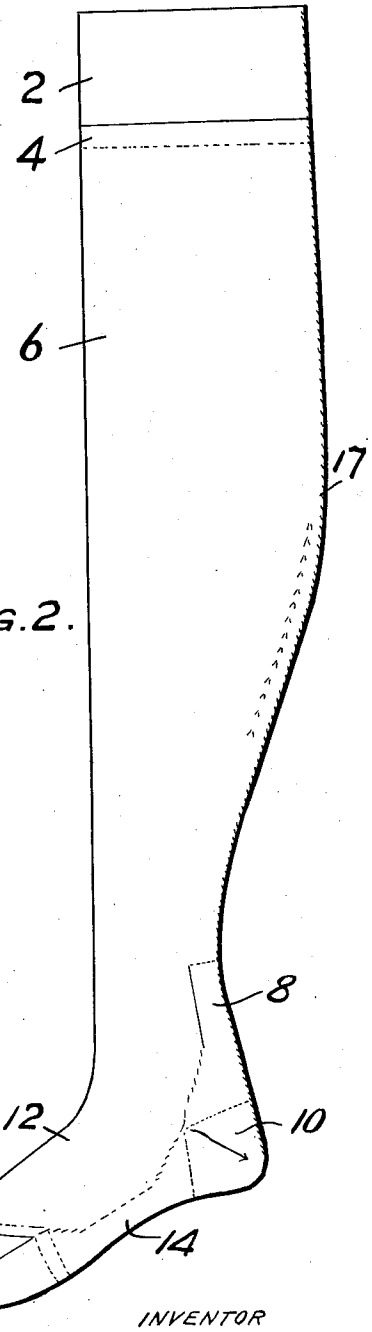

FIG. 2.

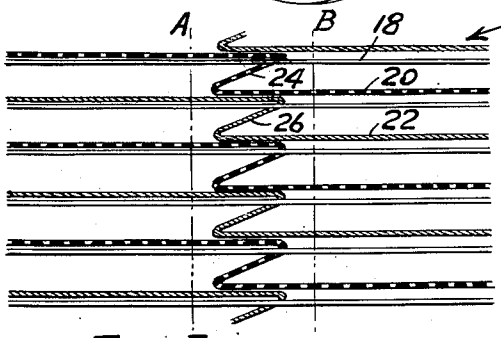

FIG. 3.

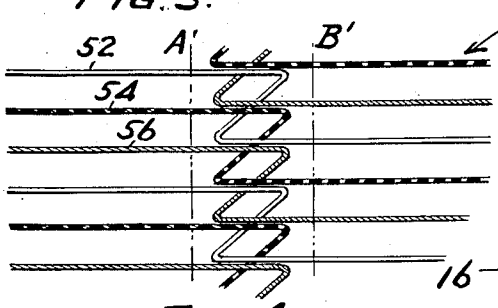

FIG. 4.

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HOSIERY AND METHOD OF MAKING THE SAME

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13 Claims. (Cl. 66—178)

This invention relates to circular knit hosiery and the method of making the same and has particular reference to circular knit hosiery which is devoid of streaks of varying shades due to irregularities in the yarns from which it is made.

Silk yarns used in the manufacture of hosiery are generally made up of a plurality of threads, the number of which depends upon the weight of the fabric which is desired. The individual threads are made up of cocoon filaments which are not of uniform diameter as formed and generally taper to an appreciable extent. If a number of these filaments are combined to form a thread and a plurality of such threads are combined to form a yarn, it is obvious that the average thickness of the yarn will be approximately constant. Nevertheless there is a substantial probability that a number of heavy (or light) portions of the filaments will lie together in the finished yarn and consequently the finished yarn, viewed as a unit, will have portions of different weight.

If such a yarn is knit to form a stocking, particularly of a sheer type in a darker shade, the heavier portion of a yarn, if a single one is used to knit, say, the leg portion of a stocking, may form a substantial number of courses. If the shade of the stocking is dark and it is of a sheer, translucent type, there will appear a darker ring running around the stocking where the heavier portion of the yarn occurs, or a light ring where a lighter portion occurs. In spite of the relatively great improbability of coincidence of abnormal portions of the filaments to such extent as to form a yarn of appreciable inhomogeneity when viewed merely as a yarn, the leg of a stocking requires such an extended length of yarn and slight variations of weight are so noticeable in the finished fabric, that the probability is quite high that in a single stocking there will occur one or more rings or streaks of the type indicated above. If such streaks are noticeable to an appreciable degree, the stockings containing them become seconds, and the waste due to this lack of uniformity is considerable.

In the knitting of full-fashioned hosiery the formation of rings can be avoided by utilizing three or more yarn carriers in succession to form the courses. The probability of having heavy (or light) portions of two of the yarns running together is quite small and the effect of a heavy (or light) portion of a single yarn in a stocking knit in the fashion just mentioned is unnoticeable.

It is the object of the present invention to provide circular knit hosiery of a ringless character in which there is avoided the effect just mentioned of heavy portions of the yarns. Such hosiery is made by a novel method which involves alternation of yarns in successive courses. In the preferred embodiment of the invention one yarn is run throughout the leg and foot of the stocking while two other yarns are knit in alternate courses with the first mentioned yarn. In this way, in spite of the replacement of yarns in each course, a structure is attained which has a maximum strength and which will not be weak at the mock seam which is sewed up the back of the stocking.

These and other objects of the invention will become apparent from the following description read in conjunction with the accompanying drawing, in which:

Fig. 1 is a perspective view showing certain parts of a circular knitting machine arranged to carry out the invention;

Fig. 2 is an elevation showing in conventionalized form a stocking formed in accordance with the invention;

Fig. 3 is a diagram indicating the arrangement of yarns forming the leg and instep of the stocking; and

Fig. 4 is a diagram similar to Fig. 3 showing a modified arrangement of the yarns.

Referring first to Fig. 2, the stocking there shown comprises a welt 2, which may be stitched or knit in conventional fashion to the ring top 4, consisting of a number of courses surmounting the leg 6. The stocking also comprises a high splice 8, heel 10, instep 12 continuous with the leg, a reinforced sole 14, and toe 16. Circular knit stockings for women's wear are generally seamed up the back as indicated at 17, and are usually provided with imitation fashion marks. These stockings are shaped or fashioned throughout in a well known manner which may be utilized in forming the stocking of the present invention and which, together with other conventional knitting steps, need not be referred to. It will be obvious that this invention requires modification only in the handling of the yarns forming the leg and instep and that the other steps may be carried out in any desired conventional fashion.

In the preferred embodiment of the invention, the leg and instep are knit with yarns associated with each other as indicated diagrammatically in Fig. 3. In this figure a plurality of successive courses are indicated formed of three yarns 18,

20 and 22 used in selective combinations. The loops are not shown but it will be understood that the diagram indicates that the yarn 18 which is run throughout the leg and instep is alternately plated by yarns 20 and 22 in successive courses, while there are limited overlaps on, say, six needles, more or less, of the yarns 20 and 22, these overlaps occurring at the back of the stocking where it is to be later seamed. The yarn 18 may be, for example, a two-thread yarn, while the yarns 20 and 22, which are preferably similar in shade to each other, but not necessarily so, may be three-thread yarns. Yarns 20 and 22 may be same or different in weight, since the spacing of successive courses is in general so slight that striations would not appear in such case. Since the yarns 20 and 22 are used in alternate courses, they float, as indicated at 24 and 26, between the ends of certain courses and points near the ends of the next courses. These floats 24 and 26 are cut out from the stocking before the seam 17 is formed. The seam 17 embraces the portions of the courses indicated between the lines A, B, Fig. 3, so that it covers the overlaps of yarns 20 and 22 and also incorporates the short ends of the floats remaining from the cutting-out process. As a result, no floats are apparent in the finished product nor is there any indication of any unconventional structure, namely, the overlap of yarns, within the seam.

By the construction just illustrated, it will be clear that the probabilities of having heavy or light portions of the various yarns falling together in the same location in the stocking is made quite small, so that objectionable rings or streaks are eliminated. It is to be noted that this structure is carried from the leg into the instep without interruption and consequently no demarcation occurs between these two portions of the stocking.

In order to secure the best results, it is desirable that the alternately used yarns 20 and 22 should plate the yarn 18, since in such fashion, although the yarn 18 contributes to the appearance, its irregularities which would occur in series of successive courses are rendered unnoticeable. Of course, all three of the yarns should be of precisely the same color if they are dyed before knitting, or should be of the same character so that the dyeing will be uniform if it occurs after knitting. The major cause of rings or streaks, however, is not dyeing but variation of weight of the individual yarns, the result of which is obviated by the present invention.

The plating of yarns 20 and 22 over yarn 18 may be secured in conventional fashion by properly relatively feeding and tensioning the yarns. The accomplishment of plating is so well known that it need not be described herein, since conventional methods are quite applicable. In general it may be said that plating may be most conventionally secured by imposing on yarns 20 and 22 heavier tensions than on yarn 18 and feeding them so that they engage the needles prior to yarn 18.

Any type of circular machine may be utilized to carry out the present invention, it being only necessary to arrange the controlling devices so as to cause a proper alternation of activity of yarn-feeding fingers or carriers. Fig. 1 is illustrative of the type of set-up which may be used, for example, in a Scott & Williams type of machine, illustrated, for example, in Patent No. 1,685,860, dated October 2, 1928. Three fingers 28, 32 and 30 are normally urged towards active position by means of springs and are arranged to carry, respectively, the yarns 18, 20 and 22. Push rods 34, 36 and 38 respectively engage these fingers, serving to raise them under the action of cams carried by a drum 40 to take these fingers out of action or replace them whenever desired. Other fingers are, of course, used in the machine to carry heel, high splice yarns, etc., but need not be illustrated here. In addition to the control of the rods 34, 36 and 38 by the cams on drum 40, which is stepped about only when different portions of the stocking are to be formed and constitutes the main controlling drum, there are provided additional controlling means for the yarn fingers comprising levers 42, 44 and 46, which are acted upon by cams 50 and 51 carried by a drum 48, which is advanced a certain part of a revolution upon the formation of each course, the stepping taking place when the needles forming the back of the stocking are being fed with yarns. In producing the fabric of the type indicated in Fig. 3, the lever 42 is not acted upon by any cams but remains in such position as to permit the corresponding rod 34 to remain lowered and the yarn finger 28 continuously in action during the formation of the leg and instep. The lever 42 may, of course, be omitted entirely. The levers 44 and 46 are successively acted upon by cams 50 and 51, whereby the fingers 30 and 32 are alternately brought into action. It may be pointed out that the cams 50 and 51 are of such angular extent as not to hold both fingers 30 and 32 out of action at the same time and, in fact, so as to permit both the fingers to be in action to produce the limited overlap referred to previously as between the lines indicated at A and B. By advancing the drum 48 once for the formation of each course, it will be obvious that the fabric of Fig. 3 will result.

In this connection, it may be remarked that various alternative types of operation might be used. For example, the yarns 20 and 22 may be used to knit successive pairs of courses, that is, each yarn may be kept in action for two courses and be then replaced by the other yarn for a subsequent two courses. This action is permissible if the variations of yarn weight and count are not such as to make two successive courses of an extra heavy or light portion produce the effect of an objectionable ring. In fact, each of the yarns such as 20 or 22 might be kept in action for more than two successive courses.

The preferred embodiment of the invention in Fig. 3 involves the running of one yarn 18 throughout all of the courses of the leg and instep. This is desirable to secure extra strength and prevent the opening up of the fabric at the limited overlap, and also overcome possible cut-outs. Furthermore, if a single yarn is so run, the overlap of the yarns 20 and 22 may be reduced or actually omitted altogether. There will nevertheless remain a fabric which will not open at the seam. Irrespective of the formation, the seaming 17 will hide the construction.

The fabric in accordance with the invention, however, need not have any yarn running continuously through all courses. For example, in Fig. 4 the fabric indicated at 6' comprises three yarns 52, 54 and 56 successively used in the formation of the leg and instep and provided with overlaps between the lines A' and B', which represent the extent of the seam running up the back of the stocking. In the formation of the type of fabric illustrated in Fig. 4, the probability of the formation of rings or streaks is

still further reduced. In such fabric the overlaps of the yarns at the rear should be moderately extensive. In order to avoid cut-out, the needles are preferably run at a high level during the overlapping.

In order to secure the most satisfactory type of product, the tensions should be so adjusted that the loops formed in successive courses are of substantially the same size, so as to eliminate even narrow streaks or rings which might otherwise appear. Such tension adjustment may be effected through the usual tension devices.

It will be clear that in the formation of this type of fabric also any yarn may be run through two or more successive courses before replacement by another. The fabric of Fig. 4 is somewhat more wasteful of yarn than that of Fig. 3 since each of the yarns must be of full weight and each of them provides floats which must be cut out. In the fabric illustrated in Fig. 3, the yarn **18** is used without the formation of any floats, floats occurring only in connection with yarns **20** and **22**. The floats of such yarns may be reduced if the grade of yarn used permits each of yarns **20** and **22** to be run in two or more successive courses without appreciable increase of the danger of formation of streaks or rings.

While there has been described a specific embodiment of the invention, it is obvious that other embodiments may be made involving, for example, the use of a greater number of yarns. For example, in the type of fabric illustrated in Fig. 3, three, four, or more yarns may be successively and cyclically used for the formation of the stitches; similarly, in the modification of Fig. 4, more than three yarns may be used. Under such circumstances, there will be even less probability of the formation of streaks or rings with, however, an increasing complexity in the operation. It is desirable, therefore, to use no more yarns than are necessary to secure satisfactory results. The arrangement and operation of the yarn carriers in more elaborate cases will be obvious. Preferably, to secure the most satisfactory product, the yarns used should be of the same color and shade, at any rate, those yarns which are substituted for each other. The latter should also preferably be of the same weight, so as to avoid the formation of any rings. This correspondence of color and shade, however, need not necessarily be the case as between, for example, yarns **18** and **20** or yarns **18** and **22** of Fig. 3, since even if **18** does differ somewhat from the others, the result will nevertheless be uniform.

It will be clear that numerous variations may be made in embodiments of the invention without departing from the scope thereof as defined in the following claims.

What I claim and desire to protect by Letters Patent is:

1. Circular knit hosiery, at least the leg portion of which comprises three yarns, one of which is knit continuously through successive courses thereof, and the other two of which are plated over the first named yarn in alternate courses, said last two yarns overlapping in loops at the rear of the hosiery, the overlap being included within stitching extending lengthwise of the rear of the hosiery, said yarns being of such type that the finished hosiery is substantially devoid of rings despite local variations of the individual yarns.

2. Circular knit hosiery, at least the leg portion of which comprises at least three yarns, at least one of which is knit continuously through successive courses thereof, and at least two others of which are cyclically individually plated over the first named yarn through at least single courses, said last named yarns overlapping in loops at the rear of the hosiery, the overlap being included within stitching extending lengthwise of the rear of the hosiery, said yarns being of such type that the finished hosiery is substantially devoid of rings despite local variations of the individual yarns.

3. Circular knit hosiery, at least the leg portion of which comprises at least three yarns, at least one of which is knit continuously through successive courses thereof, and at least two others of which are cyclically individually plated over the first named yarn through at least single courses, said last named yarns being introduced and removed at the rear of the hosiery, said points of introduction and removal being included within stitching extending lengthwise of the rear of the hosiery, said yarns being of such type that the finished hosiery is substantially devoid of rings despite local variations of the individual yarns.

4. Circular knit hosiery, at least the leg portion of which comprises at least three yarns, at least one of which is knit continuously through successive courses thereof, and at least two others of which are cyclically individually knit with the first named yarn in at least single courses, said last mentioned yarns being introduced and removed at the rear of the hosiery, said points of introduction and removal being included within stitching extending lengthwise of the rear of the hosiery, said yarns being of such type that the finished hosiery is substantially devoid of rings despite local variations of the individual yarns.

5. Circular knit hosiery, at least the leg portion of which comprises at least three yarns, at least one of which is knit continuously through successive courses thereof, and at least two others of which are cyclically individually knit with the first named yarn through at least single courses, said last mentioned yarns overlapping in loops at the rear of the hosiery, the overlap being included within stitching extending lengthwise of the rear of the hosiery, said yarns being of such type that the finished hosiery is substantially devoid of rings despite local variations of the individual yarns.

6. The method of making circular knit hosiery which comprises forming at least the leg portion thereof by knitting one yarn continuously through the formation of successive courses, and introducing two yarns during the knitting in such fashion that they will be plated over the first named yarn in alternate courses, said last two yarns being knit simultaneously for limited periods so that they overlap in loops at the rear of the hosiery, and thereafter stitching the rear of the hosiery lengthwise to include the overlap within the stitching, said yarns being of such type that the finished hosiery is substantially devoid of rings despite local variation of the individual yarns.

7. The method of making circular knit hosiery which comprises forming at least the leg portion thereof by knitting at least one yarn continuously through the formation of successive courses, and introducing a plurality of yarns during the knitting in such fashion that they will be individually cyclically plated over the first named yarn through at least single courses, said last mentioned yarns being knit simultaneously for

limited periods so that they overlap in loops at the rear of the hosiery, and thereafter stitching the rear of the hosiery lengthwise to include the overlap within the stitching, said yarns being of such type that the finished hosiery is substantially devoid of rings despite local variation of the individual yarns.

8. The method of making circular knit hosiery which comprises forming at least the leg portion thereof by knitting at least one yarn continuously through the formation of successive courses, and introducing a plurality of yarns during the knitting in such fashion that they will be knit with a continuously knit yarn through at least single courses, said last mentioned yarns being intrduced and removed at the rear of the hosiery, and thereafter stitching the rear of the hosiery lengthwise to include the points of introduction and removal within the stitching, said yarns being of such type that the finished hosiery is substantially devoid of rings despite local variation of the individual yarns.

9. Knit hosiery, at least the leg portion of which comprises three yarns, at least one of which is knit continuously through successive courses thereof, and at least two others of which are cyclically individually knit with the first named yarn through at least single courses, said last named yarns being introduced and removed at the rear of the hosiery, said points of introduction and removal being included within stitching extending lengthwise of the rear of the hosiery, said yarns being of such type that the finished hosiery is substantially devoid of rings despite local variations of the individual yarns.

10. Knit hosiery, at least the leg portion of which comprises three yarns, one of which is knit continuously through successive courses thereof, and the other two of which are knit with the first named yarn in alternate courses, said last two yarns being introduced and removed at the rear of the hosiery, said points of introduction and removal being included within stitching extending lengthwise of the rear of the hosiery, said yarns being of such type that the finished hosiery is substantially devoid of rings despite local variations of the individual yarns.

11. A translucent knitted stocking of a weight in which horizontal bands can ordinarily be observed, the leg portion of said stocking comprising three natural silk yarns, two only of said yarns being knitted into each wale throughout the major portion of every course in said leg portion, any two adjacent courses including one yarn which is knit into both courses throughout, the remaining yarn of one of said two courses being different from the remaining yarn of the other of said two courses.

12. A translucent knitted stockng of a weight in which horizontal bands can ordinarily be observed, the leg portion of said stocking comprising at least three yarns, one of said yarns being knit continuously through successive courses thereof, and the other two of which are knit with the first named yarn in alternate courses, the yarns being of such type that the finished hosiery is substantially devoid of rings despite local variatons of the individual yarns.

13. A translucent circular knit stocking of a weight in which horizontal bands can ordinarily be observed, the leg portion of said stocking comprising at least three yarns, two only of said yarns being knitted into each wale throughout the major portion of every course in said leg portion, any two adjacent courses including one yarn which is knit into both courses throughout, the remaining yarn of one of said two courses being different from the remaining yarn of the other of said two courses, said remaining yarns overlapping in loops at the rear of the stocking, the overlap being included within stitching extending lengthwise of the rear of the stocking, said yarns being of such type that the finished stocking is substantially devoid of rings despite local variations of the individual yarns.

ELMER C. LOCHHEAD.