

Jan. 20, 1931.

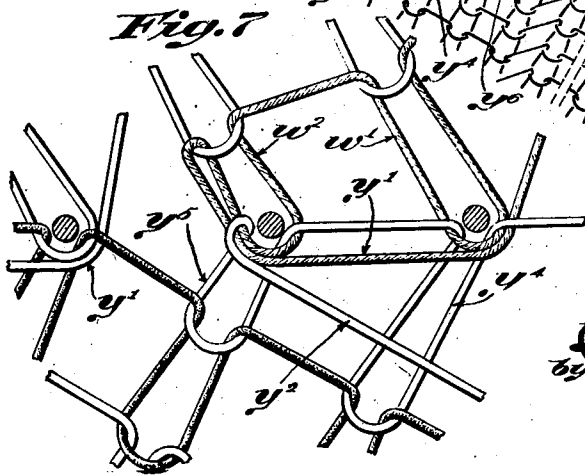
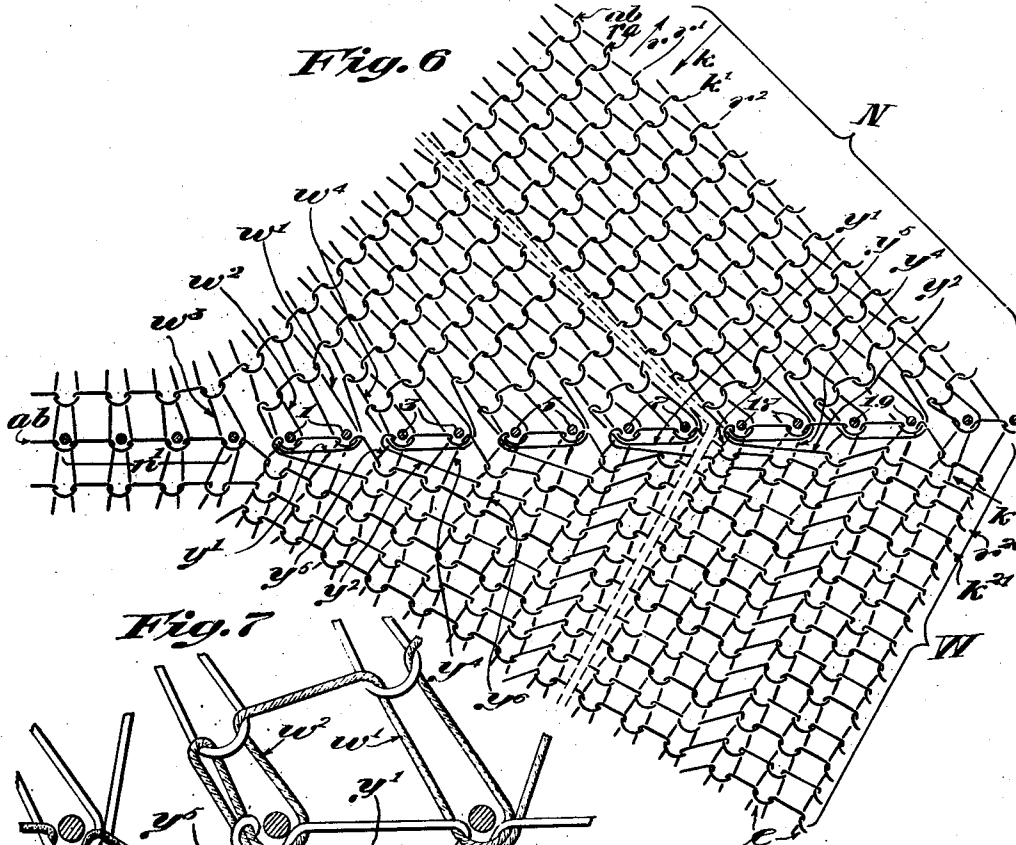
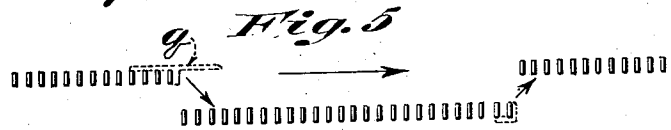
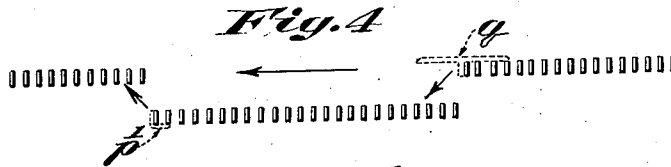
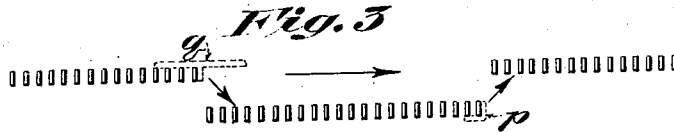
A. E. PAGE

1,789,494

KNIT ARTICLE AND METHOD OF KNITTING THE SAME

Filed May 4, 1927

2 Sheets-Sheet 2



Inventor
Albert E. Page
Robert Cushman Walling
his Attys.

Jan. 20, 1931.

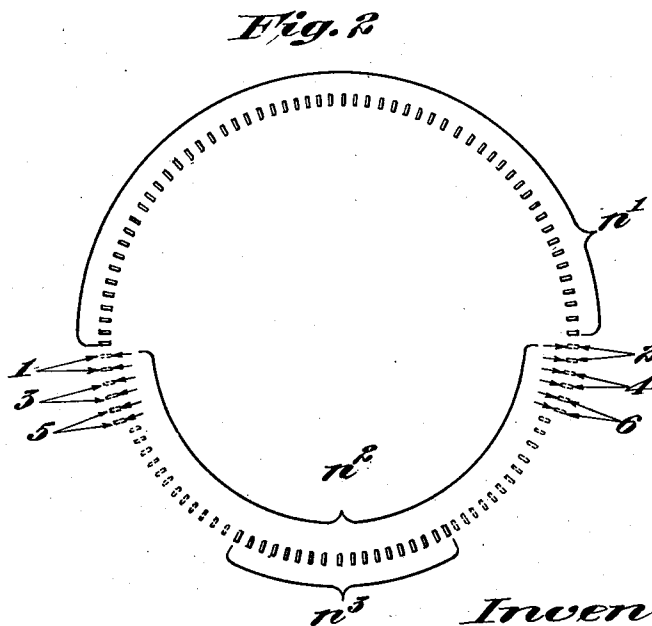
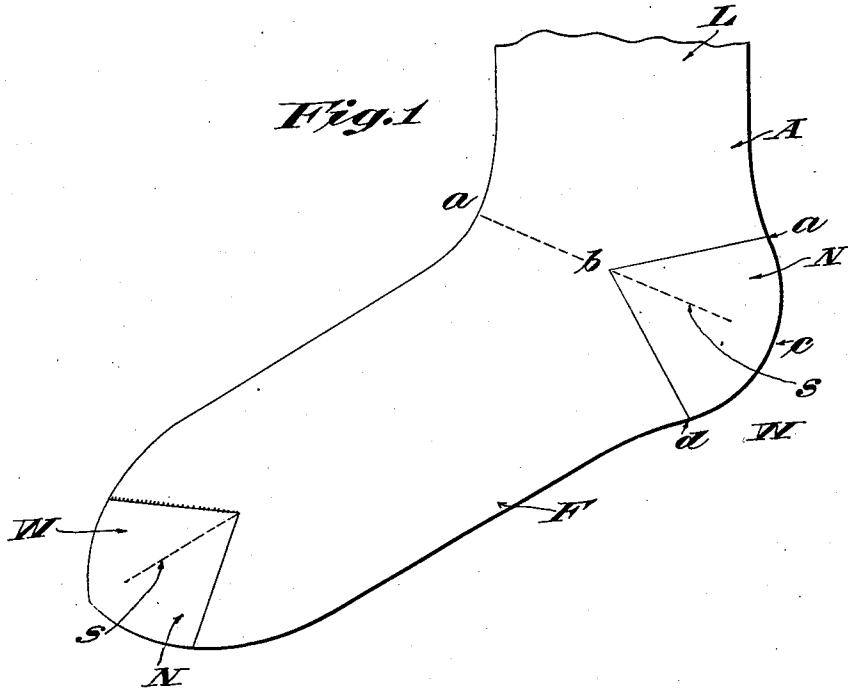
A. E. PAGE

1,789,494

KNIT ARTICLE AND METHOD OF KNITTING THE SAME

Filed May 4, 1927

2 Sheets-Sheet 1



Inventor
Albert E. Page
by *Robert Cushman Woodbury*
his Attys.

UNITED STATES PATENT OFFICE

ALBERT E. PAGE, OF BROOKLYN, NEW YORK, ASSIGNOR TO SCOTT & WILLIAMS, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF MASSACHUSETTS

KNIT ARTICLE AND METHOD OF KNITTING THE SAME

Application filed May 4, 1927. Serial No. 188,700.

This invention relates to a knit article fashioned by narrowed and widened parts, for example a stocking having narrowed and widened heel or toe pockets. One object of the invention is to provide an article of this nature without excess of fabric or slack corners in its fashioned pockets and to provide steps economizing in the extent of successive narrowing and widening operations, and hence in the time required to knit reciprocally narrowed and widened conjoined areas such as a heel pocket or a toe pocket (especially when, as usual, the article is produced by machine operations); in this aspect the invention comprises an art or method of knitting narrowed and widened structures on a series of needles, for example, on a circular segment or a straight segment of a series of needles, upon which segment wales corresponding to the narrowed and widened portions may continue longitudinally to form a portion of the article, such as the back of the leg or the sole of a stocking containing wales from other needles not used in making the fashioned parts.

Another object of the invention is to provide a knit pocket fashioned by narrowing and widening for articles of hosiery, in which narrowed and widened parts are conjoined by a new kind of suture having improved characteristics.

The invention will be explained in connection with a circular knit or "seamless" stocking in part made by well-known operations carried out on series of needles of a circular knitting machine, but the method of the invention may be practiced and the product produced on machines having needles arranged in other ways, for example in straight series on a straight needle bed or beds.

In the accompanying drawings,

Fig. 1 is a side elevation, as customarily folded for sale, of the foot portion of a stocking corresponding to the invention;

Fig. 2 is a diagram illustrating narrowing operations;

Fig. 3 is a diagram explanatory of motions of needles participating in a widening operation;

Fig. 4 is a similar diagram showing the

next course, knitting being in another direction from that of Fig. 3;

Fig. 5 is a similar diagram illustrating still another subsequent course;

Fig. 6 is an enlarged diagram elevation of a detail of the narrowed and widened fabric, for example of the inner face of one side of the heel of the stocking shown in Fig. 1, showing the kind of suture formed between the narrowed and widened areas or courses; and

Fig. 7 is an enlarged detail of Fig. 6 better to show the formation of a structure repeated throughout the suture.

Referring to Figs. 1, 2 and 6, in prior modes of making stockings of the type chosen for illustration, the leg L, ankle A and foot F were knit successively on a circular series of needles, or two straight series, in a manner familiar to the artisan; when the knitting had proceeded as far as the line *a-a*, circular knitting was suspended on the needles corresponding to the front of the leg and instep at *a-b*, and knitting then proceeded reciprocally on diminishing series of the remaining needles for a narrowed heel gore; a widened heel gore was then knit on a progressively increasing series of the needles, and tubular knitting was resumed for the foot F.

These usual heel or toe fashioning operations take an undue proportion of time of the production of the stocking as a whole, and result in a heel or toe unnecessarily long in the direction of the wales. Circular portions of the article such as the leg L, ankle A and foot F can be and are knit by round-and-round knitting on circular knitting machines at relatively high speeds, but reciprocal knitting for the narrowed gore and the widened gore of the heel pocket or of the toe pocket, for reasons related to the construction of the machines, is necessarily performed at a lower speed than the circular or tubular round-and-round knitting. In the instance of a stocking having 220 needles common practice is to narrow or widen on slightly less than one-sixth of the total number of needles; for example by knitting 35 reciprocal courses each diminished by one needle; and to widen by one needle at a stroke on a similar number of courses for heel and toe. This required 110 courses

of relatively slow knitting; for a stocking of 300 needle wales similarly proportioned, the relatively slow reciprocal knitting is required during 180 courses. Nearly or more than half of the time required to knit the whole stocking is thus spent in making the narrowed and widened areas.

I have devised the present article and method of making it in part in order to reduce this undue proportion of relatively slow manufacture, whether or not the stocking is knit by circulatory motion on a flat series of needles or whether it is knit by circular machines, and in part to provide an improved heel or toe structure having lateral elasticity at the suture and less length along the wales than stockings as now made; and so constructed as to permit wide variation of stitch-length and gauge of yarn. According to the usual old mode of knitting a stocking above mentioned the suture between the narrowed and widened gores of heel or toe extends at a slope of about 45° to the direction of the wales, due to the symmetrical diminishment of the number of needles in action by one needle at the beginning of each reciprocal narrowing course and the symmetrically corresponding increase by one needle at the end of each reciprocal widening course. But enough fabric for a suitable heel is provided by knitting a narrowed gore N, Fig. 1, containing only a fraction of the number of courses (which will result from narrowing one needle at a time) by narrowing at a higher rate than one needle at a time; and by knitting a corresponding widened gore containing only the same fraction of the number of courses which would result from widening by one needle at a time, by widening at a higher rate than, for example, as usual, widening by picking up one needle and picking down two needles during each course knit. By knitting a heel which is shorter in the sense of the number of courses required to produce it as measured along the center line of the wales e , Fig. 6, at the back of the stocking from a to d of Fig. 1, the time required to knit the heel may be greatly reduced, and a satisfactory product of conjoined narrowed and widened fabric can be made to result from diminishing this dimension of the narrowed and widened gores.

This specification now describes a new mode of knitting such a fashioned pocket with only about one-half the number of courses required in the usual procedure, in such a way as to provide a superior joint or suture elastic in the direction of its length and of strong and well-interlocked narrowed and widened selvages. By adopting these operations and the structures made by them in the manufacture of a stocking, the time required for reciprocal knitting of the heel and toe is reduced to one-half, more or less, of

the corresponding time required according to the common practices mentioned above.

One recommended procedure, referring now to Figs. 1, 2 and 6, is the conduct of knitting of a stocking as usual to the line a , Fig. 1, and then as usual to suspend knitting at the instep, by putting out of action the instep segment of needles n^1 , Fig. 2. Reciprocal knitting is now resorted to to form the narrowed gore N between the lines a , b , c , preferably by narrowing on the segment n^2 of needles remaining in operation by putting out of action two at a time needles at each end of the segment, these needles preferably being idled before reaching the yarn guide from which the active needles receive yarn for the stitches of the next course subsequent to the last course knit when the series contained them as active needles. Referring to Fig. 2, these pairs of needles may go out of action in the order shown at 1, 2, 3, 4, 5, etc. first on one side and then on the other side of the series of needles in action. Referring to Figs. 3 and 4, this operation may be performed by the usual type of narrowing or lifting pickers p or p^1 , although any mode of picking the needles will serve. This narrowing two at a time may proceed for the desired number of courses, for example for from 17 to 21 courses.

Referring to Figs. 6 and 7, one result of this procedure is to detain, for example on the needles of the leading pair in action at 1, Fig. 2, the next to the last loops w^1 and terminal loop w^2 of the first reverse course at ra , Figs. 1 and 6, following the course ab in which the instep needles n^1 ending at loop w^3 were suspended from action before completing the last part course of circular knitting by relative travel of needles in the direction of the arrow k , Fig. 6; and to cause the needles 1 (retired by picker p^1 , Fig. 4, upwardly before approaching the yarn feed in the next or back stroke of reciprocation in the direction r , Fig. 6) to take a bight of yarn y^1 around both the needles 1; the bight y^1 is not cast off, the needles 1 are out of action, and these needles and bight y^1 stand ahead of the pair of needles 3 first to knit in the first reverse and diminished course r^1 knit in the direction r , of which the first loop w^4 is at least one wale and one course removed from any loop suspended on a needle picked out of the active series. The terminal loop of a reversed course on the other side of the narrowed area corresponds to the loop w^2 . The bights y^1 having been received on the shanks of needles put up out of action in pairs, one leg of the bight y^1 crosses and covers any eyelet hole which would otherwise be formed in the fabric between the pairs of needles 1, 3, 5 etc. or 2, 4, 6 etc. at the sutures.

Referring now to Figs. 3 to 5, when a sufficient narrowed gore N has been formed, leaving the selvage structure w^1 , w^2 , y^1 on

each pair of needles retired at the initial end of each course knit in the same direction, widening for the conjoined widened gore W is performed by knitting on a series of needles exceeding by two needles in each course the last preceding course. One way of doing this is to continue to pick up out of action the leading pair of needles of the active segment including the needles n^3 , and to restore to action four needles at the following end of the active segment. A widening picker q , for example, wide enough to act on four needles leading the column of needles up out of action on each reciprocal stroke in either direction may be made active, as shown in Figs. 3, 4 and 5.

Referring to Fig. 6, the result of this, whenever knitting is in the direction k , is to restore four needles to action and knit off the narrowing selvage structure w^1 , w^2 , y^1 on each of two adjacent pairs of needles at the terminal end of one course, of which the last loop is shown at y^5 , but when the next reverse course (n^{20} , for example) is knit, the leading pair (17, for example) of these four needles is picked up by picker p^1 , loops y^4 and y^5 are not cast off, and one of the floats y^2 leading from these tucked loops to the initial reversed-course loop y^6 of the widening course, such as k^{21} , results. The terminal loop w^1 , w^2 and the float y^1 have been cast off on loops y^4 and y^5 , and any eyelet hole which otherwise would be formed between the pairs of needles at the initial reversed-course loop y^6 is closed by the effect of float y^2 . The gore W may be knit until the widened selvages are as long as the narrowed selvages, and all of the needles in segment n^2 have been restored to action; and knitting on all the needles for the foot is then resumed. It will be observed that the selvage of the widened gore is characterized by groups of four-wale courses connected at one end by a float to a subsequent course initiated in one of the central wales of the four-wale selvage course.

The toe may be knit in similar gores N and W conjoined by the same kind of suture s .

The described structures are such as to permit the narrowed and widened gores to be knit of doubled yarn or yarns of increased size, if desired in loops of increased length, no accumulation of loops in needle hooks along the sutures s being required on any needle; the bights y^1 and floats y^2 are not required to enter the hooks of the needles. In turn, this facilitates picking motions as a machine function, enables maximum speed of reciprocatory motion, and permits the width and length of the fabric in the reduced number of courses in heel and toe pockets to be controlled to a nicety by adjusting stitch-length and the weight of yarn fed during reciprocal knitting, as well as securing the whole increase in speed of manufacture resulting from reduction by substantially half

of the period of slowest knitting in making each stocking.

I claim:

1. Stocking having a knit structure for use as heel or toe comprising reciprocally knit narrowed and widened gores conjoined in knit sutures, each of said gores having the same or a less number of courses than there are selvage needle loops of its structure in one of the sutures.

2. Fashioned knit article having a pocket comprising a narrowed gore containing reciprocally knit courses each diminished by a plurality of needle wales in respect to the number of wales of the next preceding course, conjoined at its selvages to selvages of a widened gore said widened gore containing reciprocal courses each diminished at one end by a similar plurality of needle loops, and increased at the other end by a greater plurality of needle loops.

3. Fashioned knit article having a pocket comprising a narrowed gore composed of reciprocally knit courses each diminished at alternate sides of the gore in turn by a plurality of needle wales in respect to the number of wales of the last preceding course, and conjoined at its selvages to selvages of a widened gore containing reciprocal courses each diminished at one end by a similar plurality of needle loops and increased at the other end by a greater plurality of needle loops.

4. Fashioned knit article having a pocket made up of narrowed and widened gores respectively of courses of decreasing and increasing numbers of needle loops, the selvages at reversal of direction of knitting of the respective courses comprising unknit bights of yarn extending from course to course of one of said gores, and a plurality of knit loops of the same course of the selvage of a conjoined gore penetrating said bights and terminal loops and holding said bights and terminal loops of the narrowed gore.

5. Knit web having a narrowed and widened pocket containing gores respectively narrowed and widened and conjoined by an interlocked suture between selvages comprising successive pairs of loops respectively of the same course of the narrowed fabric and respectively interknit with successive loops of the same course of the widened fabric.

6. Knit web having therein a narrowed gore of successively diminished courses and a widened gore of successively increased courses, selvage edges of the said gores being interknit at a suture, said suture comprising a series of four wale-initiating loops of the same course of the widened gore and successive series of wale-initiating loops of said widened gore.

7. Knit web having therein a narrowed gore of successively diminished courses and a widened gore of successively increased

courses, selvage edges of the said gores being interknit at a suture, said suture comprising a series of four wale-initiating loops of the same course of the widened gore, and successive series of wale-initiating loops of said widened gore, said widened gore having a course whose initial loop is in one of the central wales of the needle wales initiated by said four loops.

8. Method of knitting a stocking by circular and reciprocatory knitting on a series of instruments comprising as steps knitting a circular portion of the stocking, narrowing to form a narrowed gore by retaining unknit the loops on at least two instruments at the end of a course of reciprocal knitting on a segment of said instruments, and subsequently widening by reciprocal knitting on segments of increased numbers of the instruments, knit loops of a course at the selvages of the widening area penetrating the retained loops of a plurality of courses of the narrowed gore.

9. Method of knitting a stocking by circular and reciprocatory knitting on a series of instruments comprising as steps knitting a circular portion of the stocking, narrowing to form a narrowed gore by retaining unknit the loops on at least two instruments at the end of a course of reciprocal knitting on a segment of said instruments, holding the yarn of a course containing such retained loops around the instruments retaining them to form and detain a bight, and subsequently widening by reciprocal knitting on segments of increased numbers of the instruments, knit loops at the selvages of the widening area penetrating the retained loops, and engaging the retained bights with said knit loops of a plurality of courses of the narrowed gore.

10. Method of knitting a fashioned web on a segment of instruments comprising knitting in opposite directions alternate courses of loops, each course comprising a number of loops less than its predecessor by a plurality of loops corresponding to loops of the previous course retained on the instruments, retaining a bight of the yarn of the previous course on said instruments along with the retained loops, and subsequently casting off the retained loops and bights onto knit loops by forming successive courses of increased numbers of loops, each of said courses having a series of loops penetrating two or more of the said detained bights to comprise a widened gore.

11. Method of knitting a fashioned web on a segment of instruments comprising knitting in opposite directions alternate courses of loops, each course comprising a number of loops less than its predecessor by a plurality of loops corresponding to loops of the previous course retained on the instruments, retaining a bight of the yarn of the previous course on said instruments

along with the retained loops, and subsequently casting off the retained loops and bights onto knit loops by forming successive courses of increased numbers of loops to comprise a widened gore and inter-knitting a plurality of terminal loops of a course of the said increased numbers with detained loops of a plurality of courses of the narrowed gore at sutures successively in alternate courses at each side of the narrowed and widened gores.

12. Method of fashioning heel or toe pockets on a circle of needles comprising suspending knitting on an instep segment of needles, knitting reciprocally on the remainder and suspending knitting at end needles of the remainder at each course to form a narrowed gore; and thereafter resuming knitting on four needles at one end and suspending knitting on at least two needles at the other end of each course.

13. Method of fashioning heel or toe pockets on a circle of needles comprising suspending knitting on an instep segment of needles, knitting reciprocally on the remainder and suspending knitting at a plurality of end needles of the remainder at each course to form a narrowed gore; and thereafter resuming knitting on at least four needles at one end and suspending knitting on at least two needles at the other end of each course.

14. Method of knitting a stocking by circular and reciprocatory knitting on a series of instruments comprising as steps knitting a circular portion of the stocking, narrowing to form a narrowed gore by retaining unknit the loops on at least two instruments at one end of a course of reciprocal knitting on a segment of said instruments, and subsequently widening by reciprocal knitting on segments of numbers of the instruments increased by at least two in each course.

15. Knit web having therein a narrowed gore of successively diminished courses of loops, each course having two less loops than the next previous course, and successive courses having a terminal pair of and an initial pair of loops respectively in the same wales, each loop of a pair of said terminal loops being interlocked in a suture with one of a plurality of knit loops of the same course of a widened gore throughout the suture.

Signed by me at New York city, New York, this 30th day of April, 1927.
ALBERT E. PAGE.