

Dec. 3, 1929.

W. J. WESSELER

1,738,486

KNITTED FABRIC AND METHOD OF MAKING THE SAME

Filed March 1, 1921

2 Sheets-Sheet 1

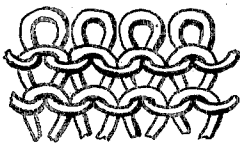
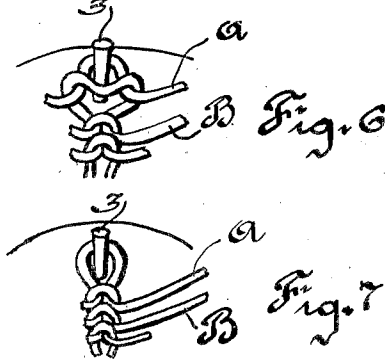
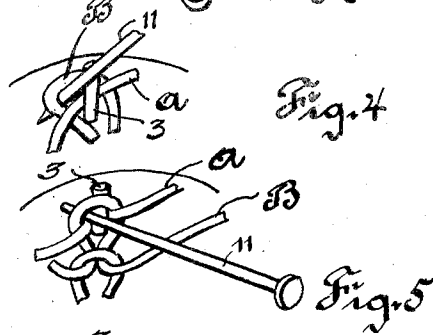
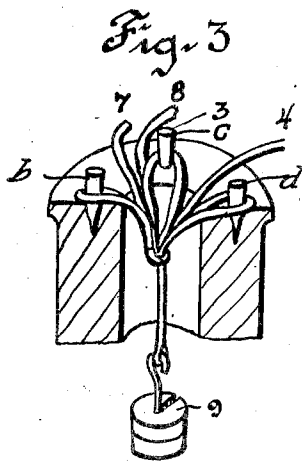
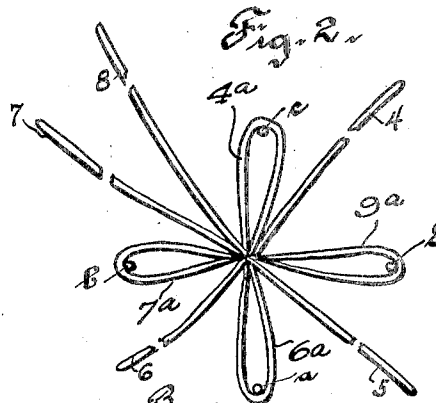
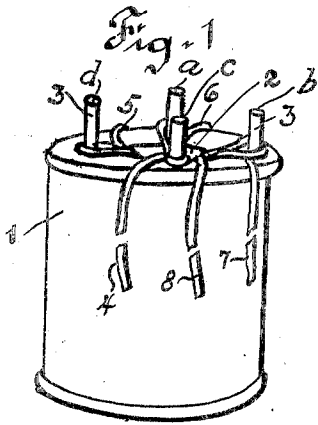


Fig. 8

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2 Sheets-Sheet 2

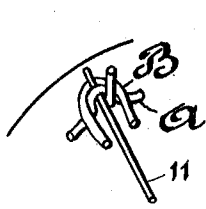


Fig. 9

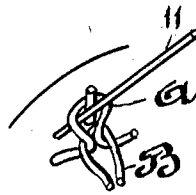


Fig. 10

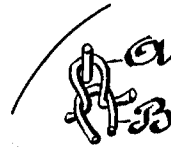


Fig. 11

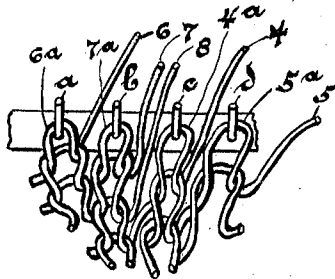


Fig. 12

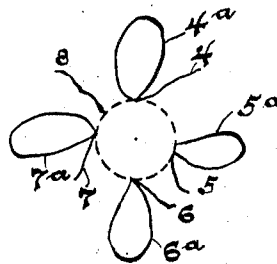


Fig. 13

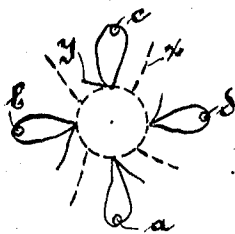


Fig. 14

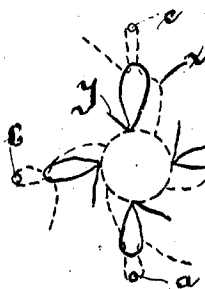


Fig. 15

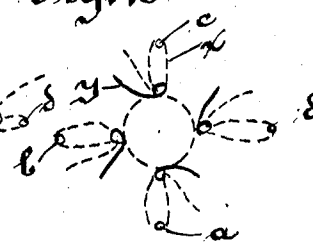


Fig. 16

William J. Wesseler.  
INVENTOR.

## UNITED STATES PATENT OFFICE

WILLIAM J. WESSELER, OF EAST CLEVELAND, OHIO

KNITTED FABRIC AND METHOD OF MAKING THE SAME

Application filed March 1, 1921. Serial No. 448,803.

Knitting as ordinarily performed at the present time is carried on with a single yarn supply or where a plurality of yarns are used in the knitting operation they are mere duplications of the single yarn type of machine, or are employed in the various forms of frame machines, traverse warp machines and the like. In rotary knitting they are also used as auxiliary yarns for facing, reinforcing, striping, and plating.

It has not been the practice, however in any knitting operation, particularly in rotary knitting, to employ a plurality of yarns in such a manner that each succeeding needle acts upon the yarn cast off by the preceding needle. It therefore results that in the usual rotary knitting operations, the needles hold the stitches for one revolution, a second row of stitches being formed upon the completion of the first row, and thus the limit of loop size is governed by the size of the needles employed, the loops necessarily being of a size to permit of the withdrawal of the needles therefrom.

Numerous expedients such as the use of spring needles and sliding latch needles have been adopted to make stitches or loops of the requisite degree of fineness for many special knitted articles. Likewise in a few instances heavy yarn tension has resulted in loop contraction upon casting off.

The object of my invention is to produce a knitted fabric having loops of any desired size irrespective of the knitting instrumentalities employed, and to improve the art of knitting in the several respects indicated in the following description and claims.

To the accomplishment of the foregoing and related ends, the invention then consists of the fabric and the method or steps for producing the same hereinafter fully described and particularly pointed out in the claims, the annexed drawings and the following description setting forth in detail certain means and mode of carrying out the invention, such disclosed means and mode illustrating, however, but several of the various ways in which the principle of the invention may be used, and the fabric produced.

In said annexed drawings:—

Figure 1 is a perspective view of one type of apparatus suitable for producing the fabric and employing the method comprised in my invention;

Figure 2 is a diagrammatic top plan view of the yarn arrangement shown in Figure 1;

Figure 3 is a sectional elevation of the apparatus shown in Figure 1;

Figures 4, 5, 6, and 7 are detail views showing the loop drawing operation in its several stages;

Figure 8 is a diagrammatic view of the usual fabric formed in an ordinary knitting operation and to which a section of fabric, made by the herein-disclosed method, may correspond in loop structure after being drawn tight, although differently related to the forming needles;

Figs. 9, 10, and 11, are detail views showing the several stages of drawing through a loop from below;

Fig. 12 is a developed diagrammatic view showing the relation of the loops of the warp fabric to the pins;

Fig. 13 is a diagrammatic view showing in spaced relation the loops and yarns shown in Fig. 2; and

Figs. 14, 15, and 16, are diagrammatic views showing the several stages of the knitting operation where an extra yarn is supplied for each pin or needle.

As shown in Figure 1 of the drawing, a spool, 1, of the usual type of simple knitting apparatus, having a central aperture, 2, is provided upon its upper end with a plurality of pins, 3, shown in the drawing as four in number. Over these are looped, respectively, a series of four yarns, 4, 5, 6, and 7, all fastened together at one end, and there joined to a fifth yarn, 8, (see Figure 3). A weight, 9, may be attached to the junction or any suitable take-up mechanism may be connected thereto.

The yarn, 8, is designed to serve as a means of freeing the loop over one of the pins from any fastening function and permit it to be manipulated to draw the loop cast off from the pin or needle, whichever instrumentality happens to be employed, to any size desired in the finished fabric. The first new loop

of the knitting operation illustrated in Figure 2, particularly, is formed by lifting the loop 4<sup>a</sup> of the yarn, 4, over the yarn, 8, and the pin, *c*, thus casting off its loop and leaving a new loop of the yarn, 8, over the pin, *c*. The cast off loop forms a part of the yarn, 4, and it is drawn tight by tensioning it directly or by holding it and tensioning it as it is looped over the pin, *d*, through the casting off of the loop, 5<sup>a</sup>, thereon. The yarn, 5, is then similarly treated with respect to loop 6<sup>a</sup> of the yarn, 6, and the pin, *a*, and the loop 7<sup>a</sup> of the yarn, 7, is in turn likewise cast off over the pin, *b*, leaving the yarn, 6, thereon. The circuit of the spool is thus completed and the yarn, 7, is then advanced to the position held by the yarn, 4, until it was displaced by the yarn, 8, which it now displaces allowing the yarn, 8, to be looped next over the pin, *d*, as it supplants the loop of yarn, 4, thereon. Thus it will be noted that with each cycle of operations the yarns are each advanced one pin in the direction of knitting. The manner of placing a new loop on a pin is shown in Figs. 4 to 7 of the drawing. The new yarn A is laid against the outside of the pin above the looped yarn B, which is lifted over the yarn A and the adjacent pin by the instrument 11 which is inserted from above between the yarns A and B as shown in Fig. 4. The loop of the yarn B is thus cast off as is shown in Fig. 5, and the instrument 11 is withdrawn. The yarns will then assume the position shown in Fig. 6, after which tension is applied to the yarn B to draw its loop into knotted position as is shown in Fig. 7, and although the fabric is warp fabric the loops will be drawn so closely together that the fabric will have the appearance and substantially the loop structure of weft type fabric. The manner in which the fabric is related to the several pins is shown diagrammatically in Fig. 12.

The loops may be cast off over the yarn or the new yarn may be drawn through from below the loop on the pin, and then placed over the pin from above, as is shown in Figs. 9, 10, and 11, or some stitches, or loops, may be made in one direction and some in the other. Thus a ribbed effect may be obtained or a plain effect and if desired the material after knitting may be drawn through to present the other side.

While a particular circular knitting operation has been described, it is not desired to limit the invention to that special type of knitting, nor are the stitches mentioned the only ones capable of being formed with the use of the principle of my invention.

Obviously I may employ an extra yarn for each of the pins and form the loops over each as one stage of the general operation, and draw the loops tight as the second stage of said operation. The tensioning may thus be accomplished by opposing the pulls upon

the several diametrically opposite yarns the fabric being maintained in a central position within the spool. This method of knitting is shown diagrammatically in Figs. 14 to 16, inclusive, in which loops of the yarns *x* are substituted on the needles for the loops of the yarns *y*, which then may be drawn tight as an independent operation. The fabric will be supported by one set of yarns under tension while the other set is casting off and the fabric is thus directly supported at substantially every stage of the operation. The individual tensioning of the individual yarns permits a very tight knot being formed with a very closely knitted fabric as a result.

The loops of the fabric are each formed of a single yarn similar to the fabric produced in ordinary circular knitting and not of crossed doubled yarns in each loop as in other types of fabric.

Either a take-up or weight may be used to draw down the finished fabric, and clamping means may be used to grip each of the yarns during the tensioning operation. When but a single extra yarn is used, the fabric may be pulled by the operator with one hand and the yarn from the cast off loop with the other hand, and a very tight loop be thus produced. Such a loop may be properly designated a needle-tight or knotted loop, inasmuch as it would be one through which a forming needle could not be drawn and in fact it might be so tightly drawn that no practical knitting instrument could be forced therethrough however finely constructed.

Other forms may be employed embodying the features of my invention instead of the one here explained, change being made in the form or construction, provided the fabric be produced, or the elements stated by any of the following claims or the equivalent of such stated elements be employed, whether produced by my preferred method or by others embodying steps equivalent to those stated in the following claims.

I therefore particularly point out and distinctly claim as my invention:—

1. A method of knitting which comprises using at least one yarn more than the number of loops in a single course of the fabric produced, and substituting upon the needles forming the loops, the extra yarn so as to leave free the yarn of the cast off loops for drawing the said loops to any desired size.

2. A method of knitting which comprises the steps for forming loops upon a plurality of knitting elements from one series of yarns, and casting off from said knitting elements the loops from a second series of yarns, and drawing the yarns of the second series to form said cast off loops of any desired size.

3. A method of knitting which comprises the steps of forming loops upon a plurality of knitting elements from one series of yarns,

and casting off from said knitting elements the loops from a second series of yarns, and drawing the yarns of the second series of yarns during the process of forming the next succeeding series of loops, to form said cast off loops of any desired size.

4. A method of knitting which comprises the steps of forming loops upon a plurality of knitting elements from one series of yarns, and casting off from said knitting elements the loops of a second series of yarns; holding the fabric, and drawing the yarns of the second series to knot tightly each of said cast off loops.

5. The method of knitting a fabric which comprises using a plurality of alternately working and idle yarns, the idle yarns being impaled in loops upon the needles and supporting the finished fabric, and the working yarns forming new loops and serving to tighten simultaneously their adjacent cast off loop sections formed at a prior stage of the knitting operation.

6. A method of knitting single yarn loop tubular fabric with an extra substitute yarn for each knitting element, which includes the step of simultaneously drawing the yarns of cast off loops upon diametrically opposite sides of the freely suspended fabric so as to bring the loops to finished size at an intermediate point between the yarns subjected to such opposing tension.

7. A single yarn loop knitted fabric made of a series of single yarn loops, formed upon a plurality of knitting elements from a series of yarns and at least one yarn more than the number of loops in a single course of the fabric produced, each loop of said series having a loop of an extra yarn substituted on the knitting element while the cast-off yarn is drawn tight, and each yarn of the cast-off loop in its turn being substituted as an extra yarn loop for the next adjacent yarn loop of said series on the succeeding knitting element.

8. A single yarn loop knitted fabric made of a series of single yarn loops formed upon a plurality of knitting elements from one series of yarns, and over which respective loops of a second series of yarns are cast-off and drawn tight, each respective yarn and loop series being alternately positioned on the knitting elements.

Signed by me, this 1st day of March, 1921.  
WILLIAM J. WESSELER.

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