May 1, 1945. O. FREGEOLLE 2,374,857

METHOD OF KNITTING

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FIG. 1.

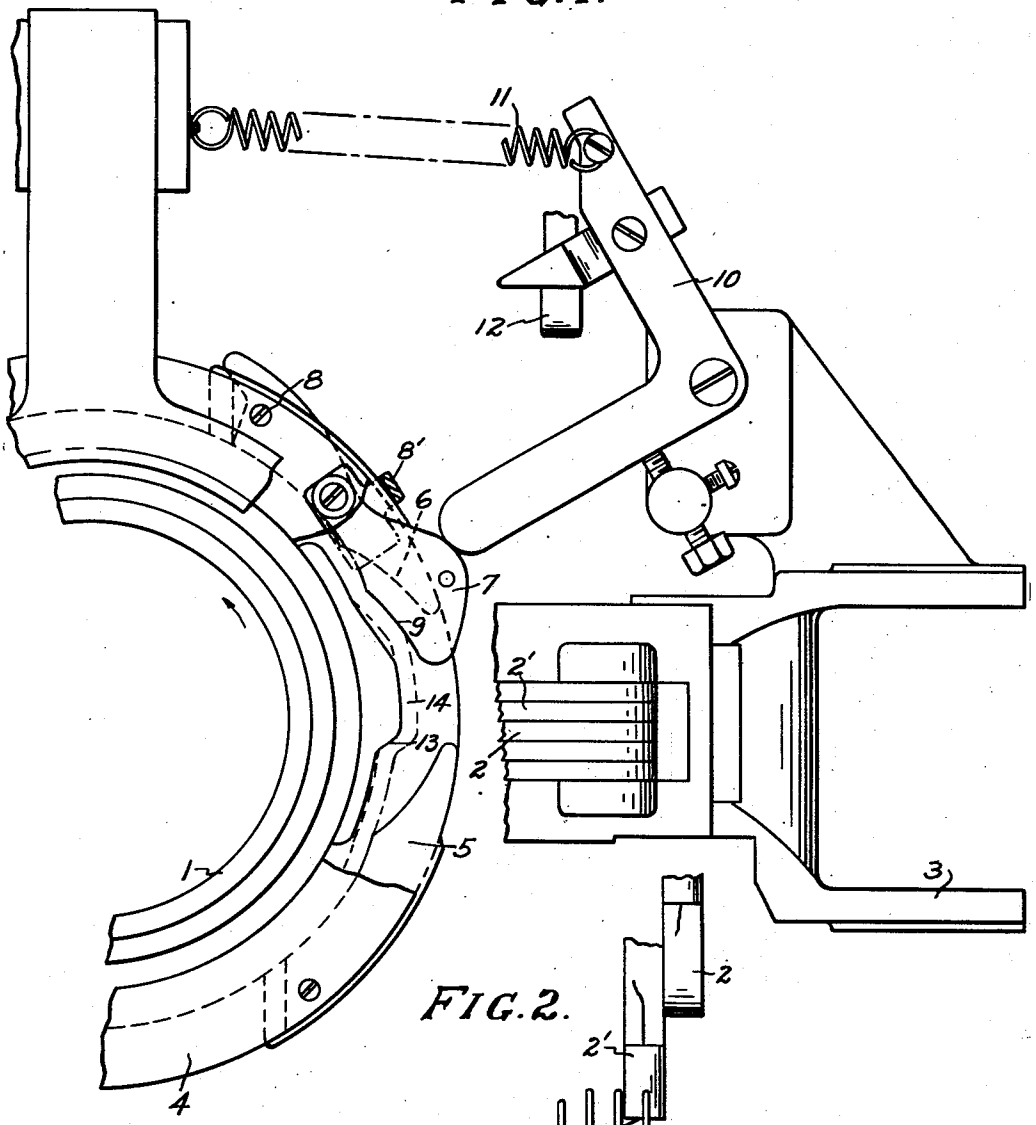


FIG. 2.

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ATT'Y.

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METHOD OF KNITTING

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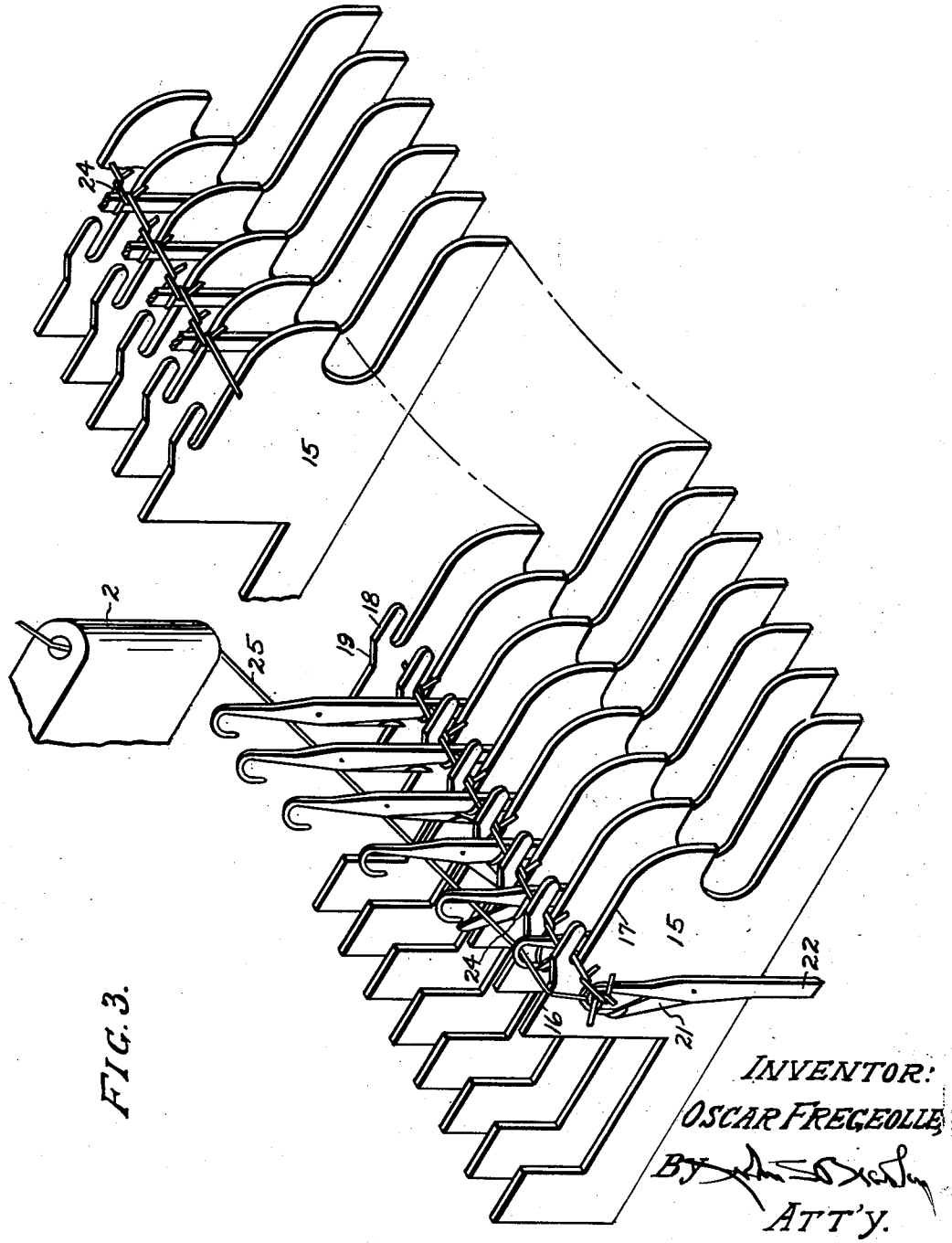


FIG. 3.

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METHOD OF KNITTING

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FIG. 4.

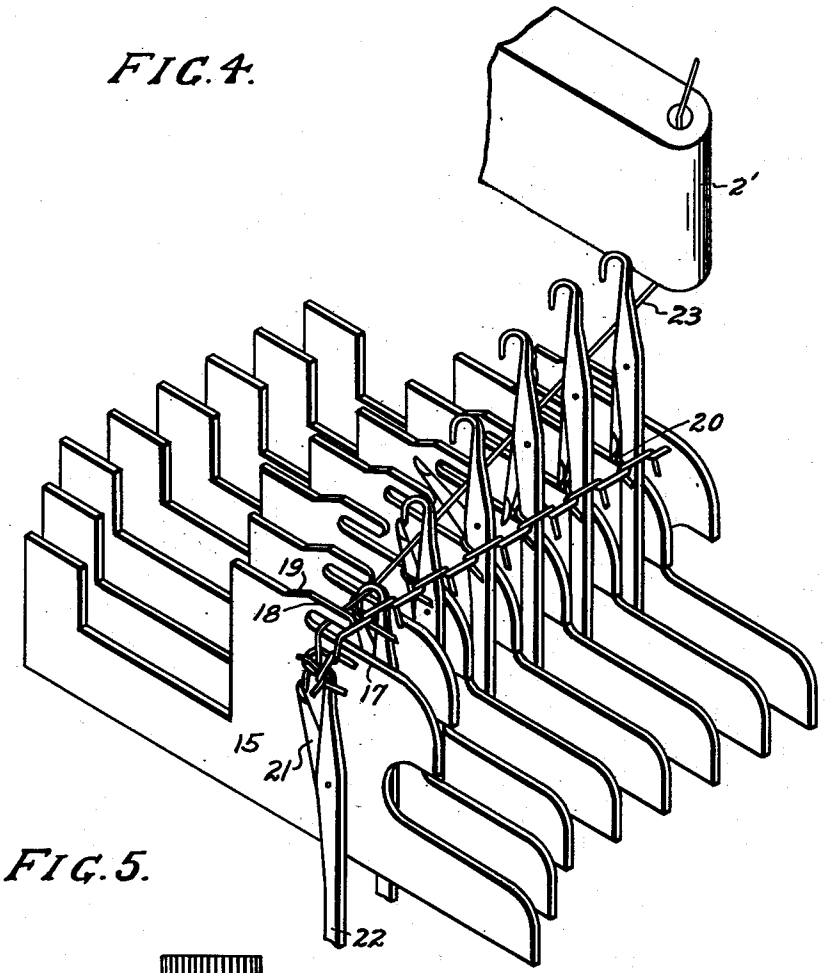
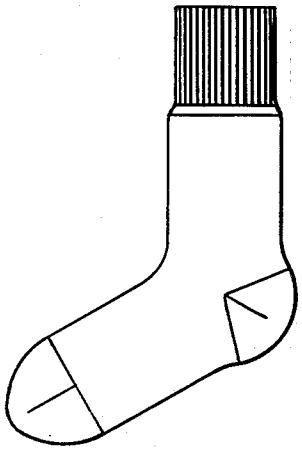


FIG. 5.



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METHOD OF KNITTING

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FIG. 6.

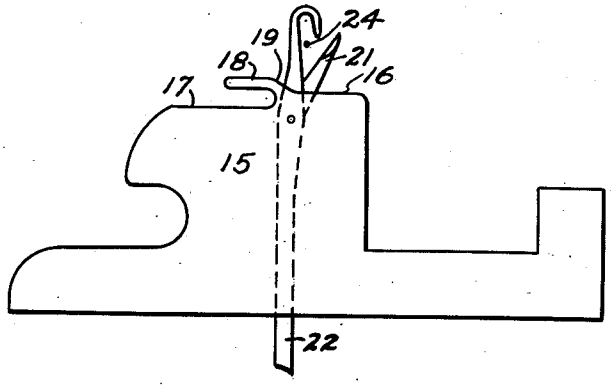


FIG. 8.

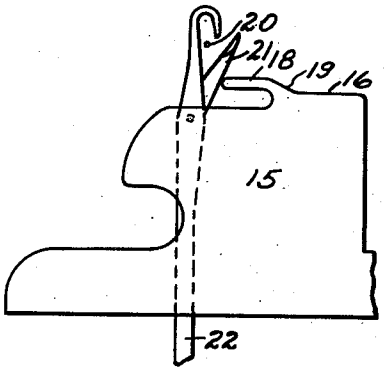


FIG. 7.

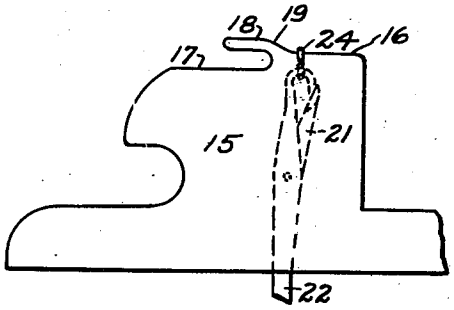


FIG. 9.

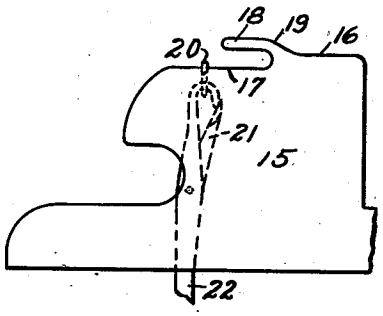
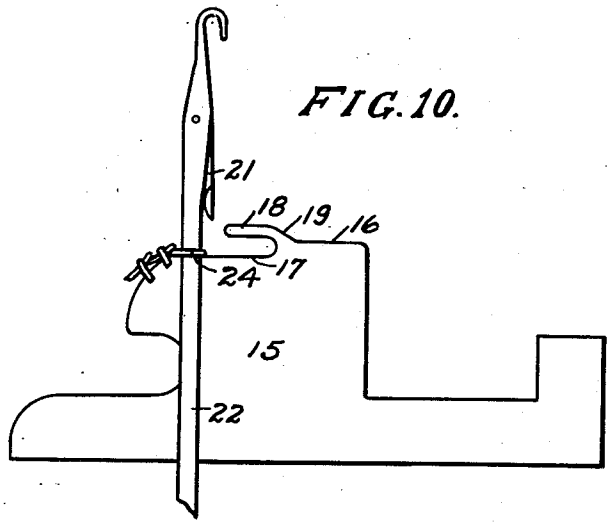


FIG. 10.



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FIG. 19.

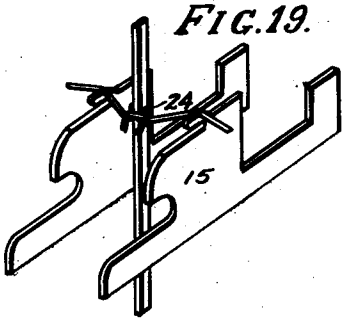


FIG. 16.

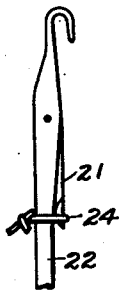


FIG. 14.

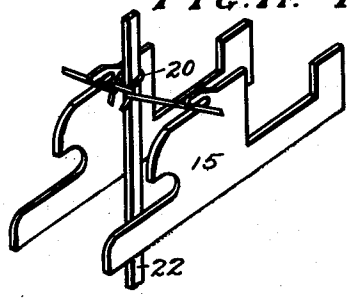


FIG. 11.

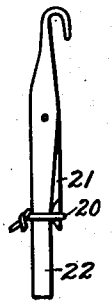


FIG. 20.

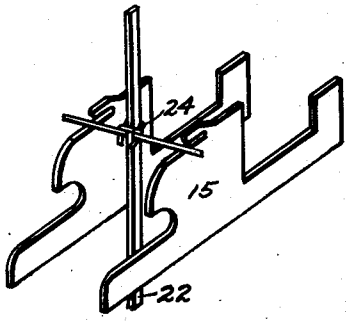


FIG. 17.

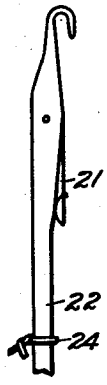


FIG. 15.

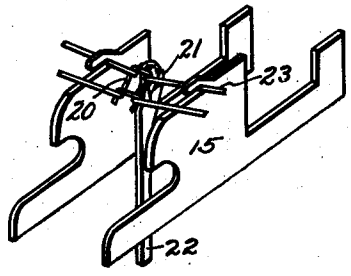


FIG. 12.

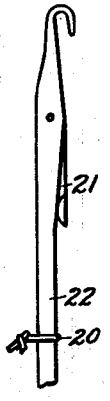


FIG. 21.

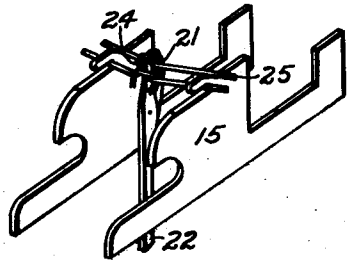


FIG. 18.

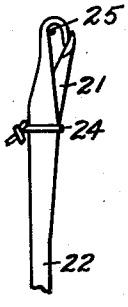
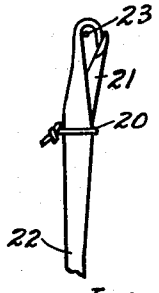


FIG. 13.



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Patented May 1, 1945

2,374,857

UNITED STATES PATENT OFFICE

2,374,857

METHOD OF KNITTING

Oscar Fregeolle, Central Falls, R. I., assignor to Hemphill Company, Central Falls, R. I., a corporation of Massachusetts

Application October 2, 1943, Serial No. 504,729

4 Claims. (Cl. 66—108)

This invention relates to improvements in a method of knitting on knitting machines of the circular, independent needle type.

Heretofore, difficulty has been encountered, particularly in the knitting of hosiery, in securing a uniform and symmetrical loop structure. It frequently happens that some of the loops are slightly tilted from the perpendicular and that one side of a loop is slightly different than the other so that the two halves are not symmetrical. Although these peculiarities are minute they nevertheless impair the over-all appearance of the fabric particularly the finer gauge fabrics. In this invention the defects mentioned are substantially eliminated with the result that a more symmetrical and better looking fabric is produced.

The invention requires only a few inexpensive and easily made changes in the mechanism and correspondingly small changes in the method of knitting but the improvement in the results obtained is very noticeable and more than justifies the trouble and expense of the alterations.

One embodiment of the invention is shown in the drawings of which:

Fig. 1 is a plan of a part of a circular, independent needle knitting machine.

Fig. 2 is a detailed view of two yarn levers and a few needles and sinkers showing the manner in which the yarns are fed and drawn;

Fig. 3 is an isometric view illustrating the method of knitting according to this invention;

Fig. 4 is a similar view following the usual method of knitting;

Fig. 5 is a view illustrating a complete sock knitted in accordance with this invention;

Figs. 6 and 7 are views of a needle and sinker illustrating the manner in which the yarn is drawn in accordance with this invention;

Figs. 8 and 9 are comparative views illustrating the usual method of drawing a yarn;

Fig. 10 is a view complimentary to Figs. 6 and 7 and Figs. 8 and 9 illustrating a further step in the knitting operation;

Figs. 11, 12 and 13 are views of a needle illustrating various steps in knitting by the usual method;

Figs. 14 and 15 are views of a needle and two adjacent sinkers also illustrative of the usual method of knitting;

Figs. 16, 17 and 18 are views comparable to Figs. 11, 12 and 13 to illustrate the method of knitting in accordance with this invention; and

Figs. 19, 20 and 21 are views comparable to Figs. 14 and 15 also illustrating the new method of knitting.

As shown in Fig. 1, the knitting machine in general is provided with the usual cylinder 1, yarn levers 2 and 2', yarn lever box 3 and sinker cap 4 to which the usual side sinker cams 5 and 6 are attached. In addition, sinker cap 4 is equipped with a flopper cam 7 pivoted as shown at 8 so that it can be swung inwardly to the position illustrated diagrammatically in Fig. 1 in order that its camming surface 9 may be made to engage the sinkers when desired. The result of moving this cam in is to cause the sinkers to move inwardly sooner and further than they would if operated by the usual cam 6 as will be evident from Fig. 1.

Flopper cam 7 is normally maintained in inwardly swung position by any suitable device such as pivoted lever 10 and spring 11. When flopper cam 7 is to be retracted, lever 10 can be swung by any suitable mechanism 12 operated from any desired timing device so that it no longer engages the flopper cam whereupon the cam will move outward until it engages stop 8' thereby making the ordinary sinker cam 6 available whenever a shift to the old method of knitting is desired.

A further modification of the machine which is desirable although not essential is that the slope 13 of center sinker cam 14 is made somewhat more abrupt than usual. The purposes of this will be explained later.

The sinkers 15 as best illustrated in Figs. 6 to 10 are provided with flat backs 16 behind the nibs which are preferably, slightly higher than the throats 17. Also the nib 18 is comparatively flat on top and terminates in an easy slope 19 leading to the back 16. The thickness of the nib 18 where it joins the sinker is preferably somewhat less than usual.

To effect plain knitting in accordance with this invention, lever 10 is operated so as to move flopper cam 7 inwardly to the position shown in Fig. 1. The result is that the sinkers will be moved inwardly sooner and further than they would be moved by the ordinary cam 6 shown in dotted lines in Fig. 1 and are held in this inward position until the draw is completed. This will cause the yarn to be laid and the loops drawn and measured over the backs 16 of the sinkers as shown in Fig. 3 instead of in the throats 17 of the sinkers, the usual method as shown in Fig. 4. This is also illustrated by Figs. 6 and 7 as compared with Figs. 8 and 9 showing the ordinary method.

When the sinkers are retracted by cam 14, the newly formed sinker loops are transferred from the backs 16 of the sinkers over the tops of nibs 18 into the throats 17 as shown diagrammatically in Fig. 10. As will be obvious, this will stretch the loops somewhat. For this reason slope 13 of cam 14 is, preferably, made somewhat more abrupt than usual, as heretofore stated and shown in Fig. 1, so that fewer sinkers than usual will be in progress of withdrawal at any one time to confine this additional strain to comparatively few loops at any given time.

It will also be evident that by this method of knitting when the sinkers move in to cast off the loops from the needles, the newly drawn yarn which is still on the backs of the sinkers will not be directly affected because the casting off will be effected through the engagement of the throats of the sinkers with the previously formed sinker loops, as will be evident from Fig. 3, whereas, by the usual method of knitting in which the newly drawn yarn as well as the previously formed sinker loops are in the throats of the sinkers, the sinkers act directly upon the newly drawn yarn. In other words, by the method of this invention, complete, previously formed, loops only are engaged by the sinkers in the casting off process whereas by the old method incomplete, newly formed, loops are engaged by the sinkers to cast off the old ones from the needles.

The result of the old method is a certain amount of robbing of yarn from the newly formed loops which may not be the same for every loop. Consequently, the loops are not all the same. By the new method, this robbing is substantially eliminated and the loops are much more uniform.

In addition, the new method of drawing the yarn on the backs of the sinkers and causing it to pass over the tops of the nibs has a novel and highly beneficial effect upon the needle loops. This can best be understood by reference to Figs. 11 to 21. By the old method in which the throats of the sinkers alone are utilized, the newly drawn needle loop 20 passes from the hook of the needle to the position shown in Fig. 11 around the latch when the needles have been raised by the raise cam and are riding upon the needle support in the well-known manner. When the needle has been raised further by the front stitch cam the loop 20 passes from the latch to the shank of the needle as shown in Fig. 12. Because the shank is considerably smaller than the combined shank and latch, the loop will be somewhat loose. This is best illustrated by Fig. 14. When the needle descends again as shown in Fig. 13, loop 20 has the burden of closing the latch and must also pass over it. When loop 20 is cast off the new yarn 23 has already been laid in the throat of the sinker so that when the sinkers advance to cast off loop 20 from the needle it will be done by pressure upon the newly laid yarn 23 as shown in Fig. 15.

The result of all of these circumstances affecting loop 20 is, in all probability, to modify the form and shape of the loops in varying degrees depending upon variations in the needles, the latches, the sinkers and in the yarn itself. It is almost inevitable that these variable factors will cause variations in the structure and arrangement of the loops which, although small, have a very noticeable effect upon the symmetry and appearance of the fabric.

When the method and mechanism of this invention is employed, the newly formed loop 24 is positioned upon the needle over the latch 21 as shown in Fig. 16. This is the same position as in the old method as shown in Fig. 11. However, when the needle has risen further so that the loop has moved from the latch onto the shank of the needle as shown in Figs. 17 and 19, the retraction of the sinkers will pull the adjacent sinker loops, which are on the backs of the sinkers, over the slopes 19 and the tops of nibs 18 which will result in the tightening of needle loop 24 around the shank of the needle as best shown in Figs. 19 and 20. When the needle descends to draw the yarn in the next course, loop 24 must, of course, close the latch and pass over it as shown in Fig. 18 but because loop 24 has been tightened around the needle shank and thus brought to a substantially definite size this subsequent stretching, while it may alter somewhat the size of the loop, will do it with substantial uniformity. Furthermore, when the sinkers move in again to cast off loop 24 the adjacent sinker loops are now in the throats of the sinkers as shown in Fig. 20 so that the sinkers engage with these completed loops to cast off needle loop 24 instead of with the new yarn 25 which has just been laid across the backs of the sinkers as shown in Fig. 21. Therefore, practically all of the strain of casting off loop 24 is imposed upon the adjacent, completely formed sinker loops which are substantially rigid and almost not at all upon the newly drawn and comparativey unstable loops of new yarn 25.

The stretching of the yarn 25 when it is moved progressively from the backs of the sinkers and over the tops of their nibs, in addition to tightening the yarn around the shank of the needle, tends to equalize the amount of yarn on either side so that both the needle and sinker loops are straighter as well as more uniform in other respects. The subsequent passage of the equalized needle loop over the latch of the needle, where it is slightly stretched in a uniform manner, also tends to reduce the size of the adjacent sinker loops slightly and with equal uniformity. Therefore, in the finished fabric the needle and sinker loops are more nearly of the same size and shape, the wales are straighter and the fabric as a whole much more perfect and pleasing to the eye. This is particularly important in the sheerer knitted fabrics in which the smallest imperfections and differences are conspicuous.

It is realized that, in reverse plating, yarns have been drawn over the backs of the sinker nibs, the sloping back of the nib being utilized to insure the correct plating relation of the yarns. That is to say, the yarn which is fed lower on the needle and, consequently, to appear on the outside of the fabric, makes contact with the sloping back of the nib first and is deflected outwardly thereby so that when the drawing of the yarn is completed it will lie definitely outside of the other yarn. However, this drawing over the back of the nibs of the sinkers is quite a different thing from drawing over the backs of the sinkers behind the sinker nibs particularly insofar as the resulting fabric is concerned.

Whenever a yarn is drawn over a sloping surface it will obviously slip upon that surface. The amount of slip depends upon the smoothness of the surface and also upon the relative positions and movements of the needles and sinkers. If the needle is positioned considerably ahead of the base of the sinker nib, as is usually the case, the draw as it progresses and as the yarn slips down the back of the nib has a constantly varying angle to the drawing surface. The slightest varia-

tion in the timing, extent and direction of movement of the sinkers is bound to affect the length of the stitch drawn because every point upon the sloping drawing surface will produce a different length of stitch. This fact is accentuated where the sinkers are in motion during the drawing of the stitch which is generally the case.

While this method of reverse plating is considered quite satisfactory its approval results from the fact that the yarns are definitely positioned thereby so that the resulting plating is better than that produced by previous methods and this fact has been thought to more than compensate for the inequalities in loop length which are unavoidable when this method is followed. Although the differences in length of loop are minute, the loops themselves are minute also and it is well recognized that such tiny differences have a decidedly harmful effect upon the appearance of the fabric.

Even if the sinkers are pushed in during the draw so that the yarn slips down to the base of the nib or substantially upon the back of the sinker before the downward movement of the needle is completed the loops are nevertheless drawn and their length determined while the yarn is over the backs of the nibs and any additional movement of the needles after the yarn has reached the base of the nibs, assuming that it ever does, is insufficient to take up the full length of the drawn loop and, consequently, the length of the loop is not affected. The fact that the final movement of the needle may be more or less in line with the base of the nib is simply the result of the necessary sinker and needle movements incident to casting off the old loops and has no direct bearing whatever on the lengths of the new loops drawn.

It cannot be said that the yarns in reverse plating may make such light contact with the backs of the sinker nibs as to merely slip down them to be actually drawn after they have reached the base because in order to maintain the proper plating relation of the two yarns they must be under considerable tension, particularly the outside yarn and must be actually held against the backs of the nibs at all times during the drawing of the loops if this relation is to be maintained. That is why, in practice, the sinkers are moved out a little during the drawing of the yarns.

On the other hand, where the yarns are drawn over the backs of the sinkers as in the present case as distinguished from over the backs of the nibs a drawing surface of definite height is provided so that the loops are bound to be of a definite length. This fact coupled with the subsequent manipulation of the loops when they are transferred from the backs to the throats of the sinkers over the tops of the nibs and particularly when they are cast off through the engagement of the sinkers with the previously formed sinker loops only produces a fabric having the greatly improved construction and qualities already enumerated.

I claim:

1. A method of knitting a body yarn upon a circular, independent needle, knitting machine which includes the steps of drawing a body yarn over a part of the backs of radially motionless sinkers having a definite height and through the needle loops of the previous course, casting off the previously formed needle loops by means of the sinkers acting upon the intervening previously formed sinker loops only and causing the newly drawn sinker loops to pass from the backs to the throats of the sinkers over the tops of the nibs.

2. A method of knitting a body yarn upon a circular, independent needle, knitting machine which includes the steps of moving the sinkers in soon enough and far enough that yarn can be drawn over their backs behind the nibs and then causing them to remain radially stationary while the yarn is so drawn, drawing the yarn over a part of the backs of the sinkers having a definite height and through the needle loops of the previous course, casting off the previously formed needle loops by the sinkers acting upon the intervening, previously formed, sinker loops only and causing the newly drawn sinker loops to pass from the backs to the throats of the sinkers over the tops of the nibs.

3. A method of knitting a body yarn upon a circular, independent needle, knitting machine which includes the steps of drawing a body yarn over a part of the backs of radially motionless sinkers having a definite height and through the needle loops of the previous course, casting off the previously formed needle loops by the sinkers acting upon the intervening, previously formed, sinker loops only, reducing and equalizing the size of the newly formed needle loops around the shanks of the needles below the latches by stretching the newly formed sinker loops by causing them to pass from the backs to the throats of the sinkers over the tops of the nibs and reducing and equalizing the size of the newly formed sinker loops by stretching uniformly the newly formed needle loops by causing them to pass over the closed latches of the needles.

4. A method of knitting a body yarn upon a circular, independent needle, knitting machine which includes the steps of moving the sinkers in early enough and far enough so that the yarn can be drawn over their backs behind the nibs and then causing them to remain radially stationary while the yarn is so drawn, drawing the yarn over a part of the backs of the sinkers having a definite height and through the needle loops of the previously knit course, casting off the previously formed needle loops by the sinkers acting upon the intervening previously formed sinker loops only, tightening the newly formed needle loops and stretching the newly formed sinker loops by causing the newly formed sinker loops to pass from the backs to the throats of the sinkers over the tops of the nibs.

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