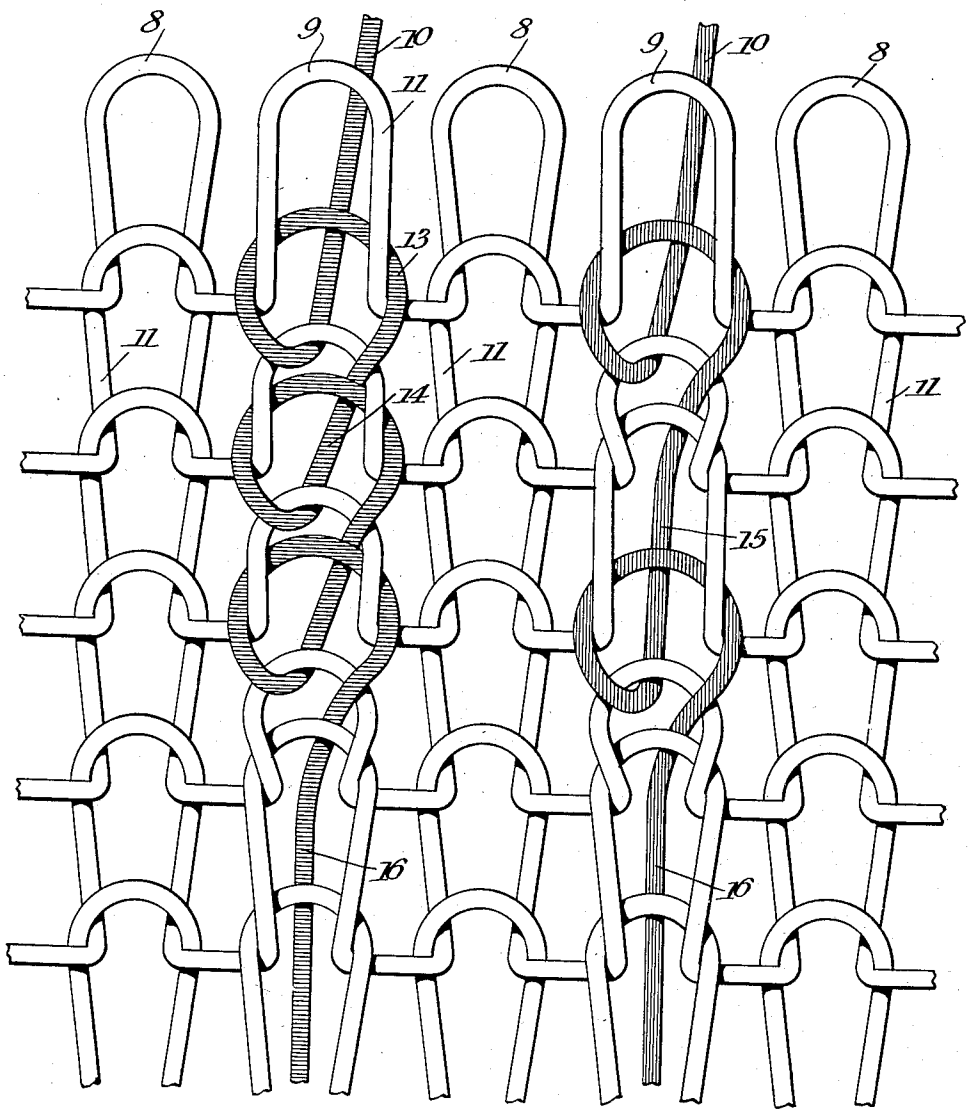
May 2, 1933. N. LEVIN 1,907,185

KNITTING MACHINE AND METHOD OF KNITTING

Original Filed May 29, 1931 2 Sheets-Sheet 1

Fig. 1.



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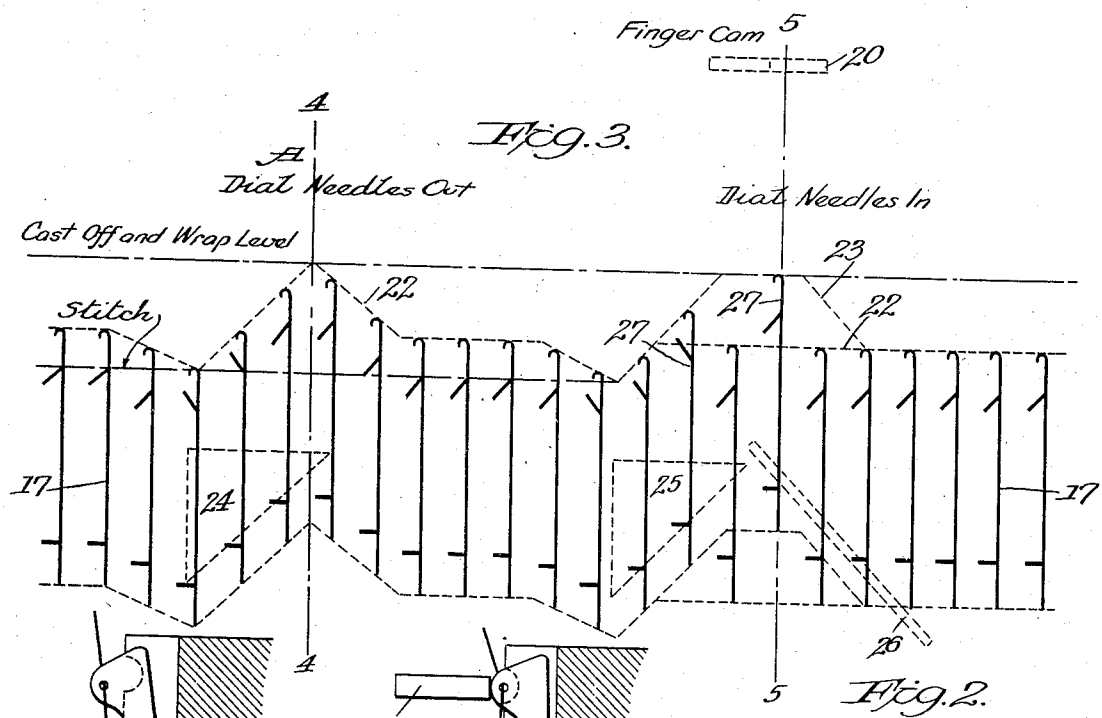


Fig. 2.

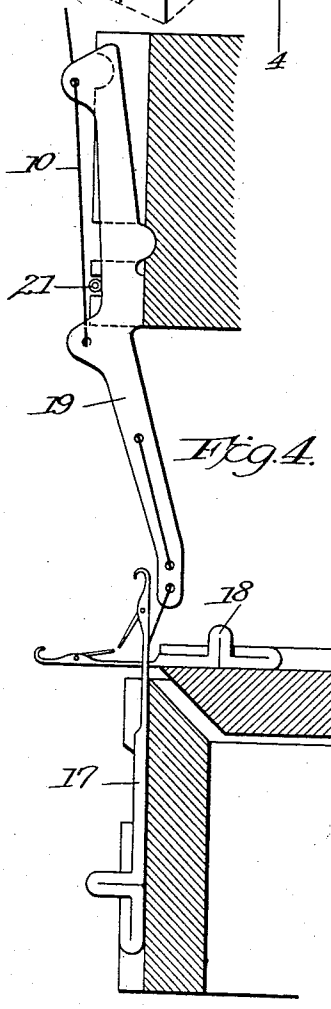


Fig. 4.

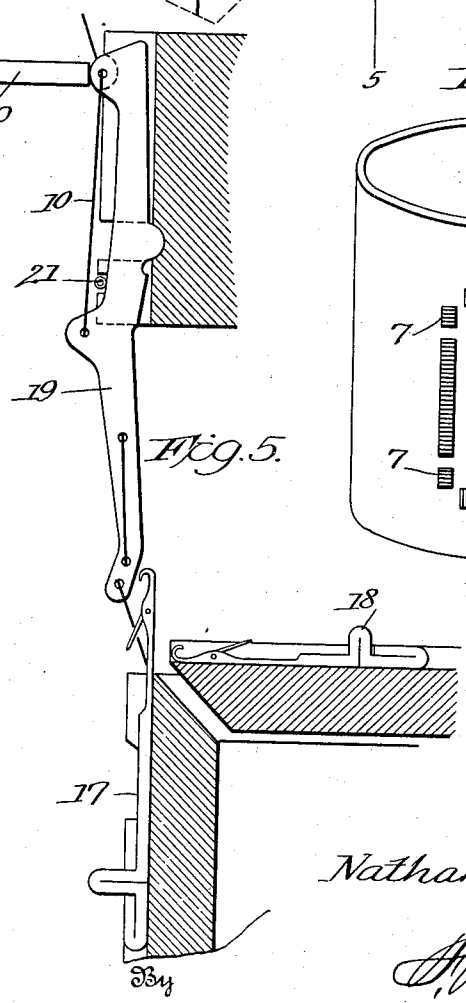
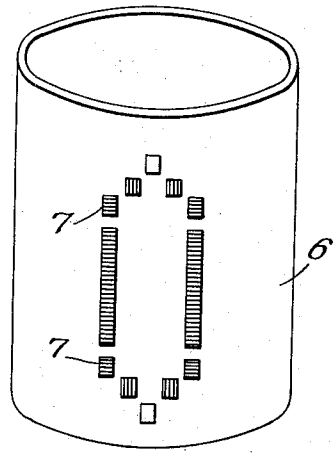


Fig. 5.



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UNITED STATES PATENT OFFICE

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KNITTING MACHINE AND METHOD OF KNITTING

Original application filed May 29, 1931, Serial No. 541,016. Divided and this application filed November 21, 1931. Serial No. 576,587.

The principal object of this invention is to provide a new method of operating a circular independent needle rib knitting machine and to make a new tubular knit rib fabric formed of a weft body yarn having designs interknit with or embroidered thereon by stitches of other warp yarns.

In the drawings:

Fig. 1 illustrates the stitches in detail,

Fig. 2 illustrates a section of fabric,

Fig. 3 illustrates a diagrammatic view of the needles,

Fig. 4 illustrates the position of the needles on line 4—4 of Fig. 3 and

Fig. 5 illustrates the position of the needles on line 5—5 of Fig. 3.

As shown in Fig. 2 there is a tubular section 6 of rib fabric having a design 7 on the face thereof. Obviously this design may vary as desired. In Fig. 1, an enlarged view of the stitches of a portion of the fabric shown in Fig. 2, including the design, is shown.

In Fig. 1 the rib fabric is composed of the plain outside wales 9 and the inside rib wales 8. The wales 8 contain stitches of the weft body yarn 11 exclusively, whereas the wales 9 contain stitches of the weft body yarn 11 and of the other warp yarns 10, 10, each independent respectively to a wale 9. In the wales 9 the stitches of body yarn 11 are interknit with or drawn through the stitches 13 of the other yarns 10, in alternate succession where the design calls for the continuation of the same. Preferably the other warp yarns 10, 10, are different in color from each other and from the body yarn, so that a design may be formed, however the selection as to color is entirely arbitrary. The best results are obtained with the warp yarns equal to or slightly larger in diameter than the body yarn.

At 14 is shown a portion of the yarn 10 as it extends from one stitch 13 to another stitch 13 in the same wale, floating past the single intervening stitch of the body yarn 11. At certain times in accordance with the design, the yarns 10, 10, float, as at 15 and at 16, past more than a single stitch of the body yarn, in which case the successive stitches of the body yarn 11 in the wales 9, 9 are interknit with or drawn through each other, instead of through the stitches 13 of the warp yarns 10. It will be seen therefore that in those plain wales where the yarns 10 are formed into stitches, that those plain wales contain twice the number of stitches of two distinct yarns that are knitted in each of the rib wales or each of the other plain wales within a given length of fabric, and that the overall length of all the wales is substantially the same, the extra stitches of the warp yarns being forced to open wider than the stitches of the body yarn and being forced toward each other, by virtue of the fact that the lesser number of stitches in the intervening rib wales tends to draw the fabric to the length determined by the length of the rib wales alone. Thus the stitches of the warp yarns are forced into a raised or embroidered relation to the body stitches, and at the same time tend to cover up substantially all of the single intervening stitches of the body yarn so that the latter cannot be seen upon casual inspection. Furthermore due to the fact that the entire fabric is made up of stitches each of which contains a single yarn only, it is possible to draw the stitches into very small or tight loops in contradistinction to stitches that are made up of a body and a plating yarn in the same stitch. By single yarn is meant a yarn which may contain one or more strands, the term being used to distinguish from a plurality of yarns such as are necessarily used in making plating stitches. The design and the outline thereof may vary as desired so that the same may be either parallel, at an angle, or perpendicular to the wales.

Referring now to Figs. 3 to 5, the preferred method of manipulating the needles to form the fabric will be described. The relation of the cylinder needles 17, and the dial needles 18 is the same as in the usual circular independent needle rib machines. The fingers 19 carrying the warp yarns 10 are disposed in their bed in the relation to the needles 17 and 18 as shown in Figs. 3 and 4. Only those features of the means

for operating the needles and fingers will be described which are in addition to or need special mention over the usual means. The fingers 19 are moved about their pivot point from the position of Fig. 4 to the position of Fig. 5 by means of the finger cam 20, the return movement being made by the spring band 21, or by a suitable cam. The action of the end of the finger adjacent the needle 17 to wrap the warp yarn 10 around the same is a camming action and is well known in the art.

In Fig. 3 there is a diagrammatic representation of the needles. The cylinder needles 17, when they follow the path 22 throughout are raised at feed A by the usual means, to the position of Fig. 4 on line 4—4 of Fig. 3, to clearing level where the needle latches clear the old stitches of the weft body yarn 11 (Fig. 1). Thereafter the new stitches are formed of the body yarn as the needles 17 take the same and are drawn by stitch cam 24 down to the stitch level, beneath the said cam. At this point i. e. line 4—4, the dial needles 18 are out and take the body yarn in the usual way, that is the cylinder needles draw the yarn over the dial needles, and the latter then form rib stitches thereof. In fact the entire knitting action at feed A is identical with the ordinary action of cylinder and dial needles forming the usual types of rib stitch of a body yarn and is therefore familiar to those skilled in the art.

At feed B there is no weft or body yarn fed to the needles, but only the warp yarns 10, and these are fed to selected needles only. If, at this feed, none of the needles 17 are selectively raised by the wheel 26 then they do not cast off their stitches of body yarn, but merely pass idly under the second stitch cam 25, and onto feed A where regular knitting takes place on all the needles. If, however, certain needles such as 27, 27 are raised by the wheel 26 to the path 23, these needles reach the latch-clearing level and their body yarn stitches slip down below their latches, these needles taking on a warp yarn 10, as the fingers 19 are actuated at that time by the cam 20 and by spring 21 to cause the cam ends thereof to wrap the warp yarns around the selected needles as shown in Fig. 5. After the wrapping takes place, these selected needles pass under the second stitch cam 25 to draw the warp yarns into stitches 13 (Fig. 1), drawing the same through the body stitches which have just previously passed below the latches of said needles and then these needles continue on to feed A where regular rib knitting takes place on all the needles. At feed B the dial needles are as shown in Fig. 5, and since no body yarn is fed, only warp knitting takes place at this feed. The fingers 19 are each associated individually with a needle 17 and are placed, in accordance with the desired design, with certain needles. They are thereafter actuated continuously by cam 20 at feed B, so that if a needle is raised such as needle 27, it is wrapped by the action of its own finger, whereas if a needle is not raised and it has a finger associated with it, then the actuation of that finger is simply an idle movement, the needle not being high enough for cam contact between the finger and itself. No body yarn is fed at feed B, the needles which are selectively raised to form the design cast off their stitches of body yarn and take a warp yarn from their respective fingers and knit the same. At feed A the selected needles as well as all the others cast off their stitches of warp and of body yarns and take on the weft body yarn to knit the same.

If desired, stitch cam 25 may draw a longer stitch than stitch cam 24, without injuring the body stitches on unselected needles, for the reason that at feed A the dial needles are out and the cylinder needles determine the stitch length by drawing their stitch over the dial needles, whereas at feed B the dial needles are in and the body stitches are formed so that there are no dial needles over which to strain the yarn with a slightly longer draw to the cylinder needles. This long draw on the selected needles acts to form the stitch, whereas this same longer draw on the unselected needles merely takes up on the body yarn stitches without injuring them.

In Fig. 3 an ordinary design wheel of common knowledge in the art is shown at 26 in dotted lines, as one type of selective cylinder needle raising means. It is obvious that any type of needle selecting means may be employed at feed B to perform this function of selectively raising certain needles to form a design.

At feed A the rib inside wales 8 (Fig. 1) and so much of the plain outside wales 9 as are formed of the body yarn 11 are made. At feed B only the stitches 13 of the warp yarns 10 are made as has been made clear in the foregoing specification.

This application is a division of my application Serial No. 541,016 filed May 29, 1931.

Having thus fully described my said invention, what I claim as new and desire to secure by Letters Patents is:

1. The method of operating a circular series of independent cylinder and dial needles and a series of wrap fingers at two feeds of a knitting machine which comprises the steps of actuating the cylinder and dial needles at one feed and of actuating certain cylinder needles and the wrap fingers at the other feed.

2. The method of knitting a tubular knit rib fabric of a weft body yarn and of warp

design yarns on a circular independent needle rib knitting machine at two feeds, which comprises the steps of weft knitting of the body yarn at one feed and of warp knitting of the design yarns at the other feed.

3. The method of knitting a tubular knit rib fabric of a weft body yarn and of warp design yarns on a circular series of independent cylinder and dial needles and a series of wrap fingers at two feeds, which comprises the steps of actuating the cylinder and dial needles at one feed for weft knitting of the body yarn and of actuating selected cylinder needles and the warp fingers at the other feed for warp knitting of the design yarns.

4. A two-feed knitting machine comprising a circular series of independent dial and cylinder needles, a series of wrap fingers, means for actuating cylinder and dial needles at one feed to knit a rib fabric, and means for actuating certain cylinder needles and wrap fingers at the other feed for making designs on the rib fabric.

5. A two-feed rib knitting machine comprising a circular series of independent dial and cylinder needles, a series of wrap fingers means for weft knitting of the body yarn at one feed and means for warp knitting of the design yarns at the other feed.

6. A method of making patterned knitted fabric on a dial and cylinder rib knitting machine comprising knitting a body yarn on both cylinder and dial needles at a main feed, isolating selected cylinder needles in certain courses, supplying to said isolated needles pattern yarns specific to the individual needles, and knitting off the loops of body yarn on said isolated needles only while holding the loops of body yarn on the other needles.

7. A method of making patterned knitted fabric on a circular rib knitting machine comprising knitting body yarn at a main feed on both cylinder and dial needles, feeding into the hooks of one or more needles at another point pattern yarns individual to said needles, and actuating said needles to knit off their body yarn stitches and to form loops of the pattern yarns before they again take body yarn.

In testimony whereof I affix my signature.

NATHAN LEVIN.