Nov. 21, 1933. N. LEVIN 1,936,024

TUBULAR RIB FABRIC

Filed May 29, 1931 2 Sheets-Sheet 1

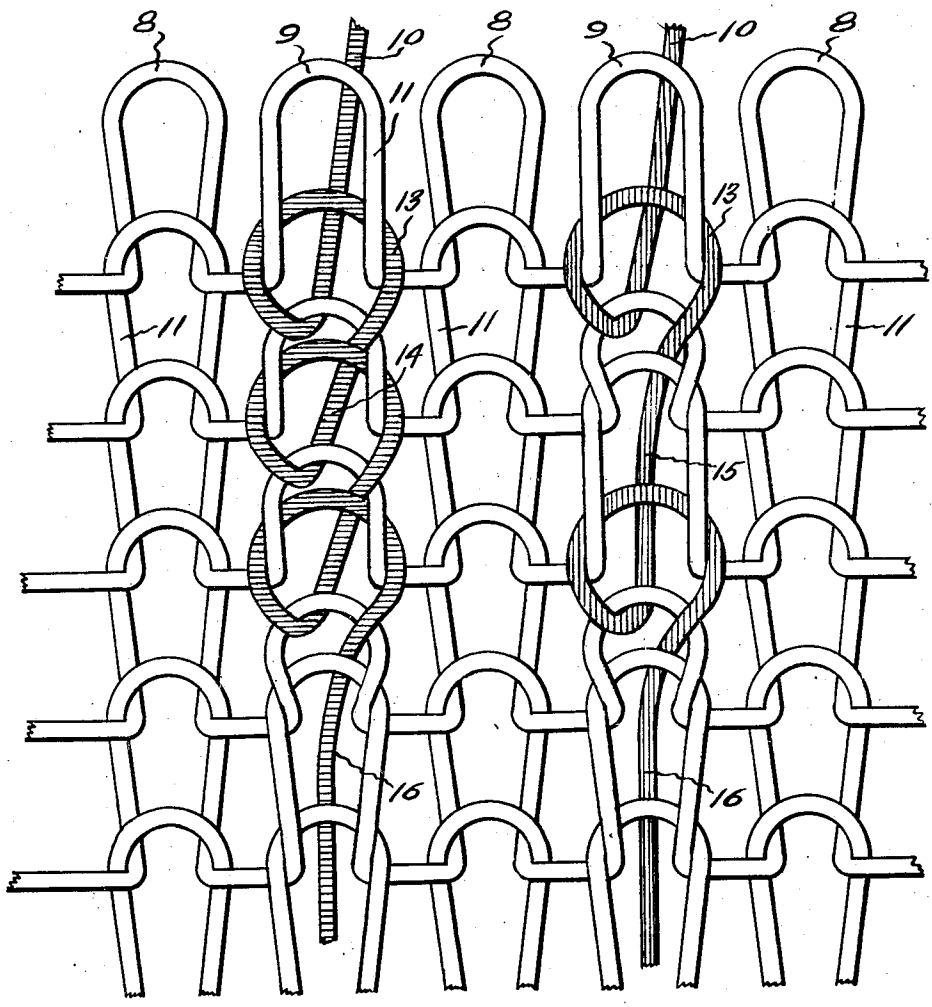


FIG 1

INVENTOR.

Nathan Levin

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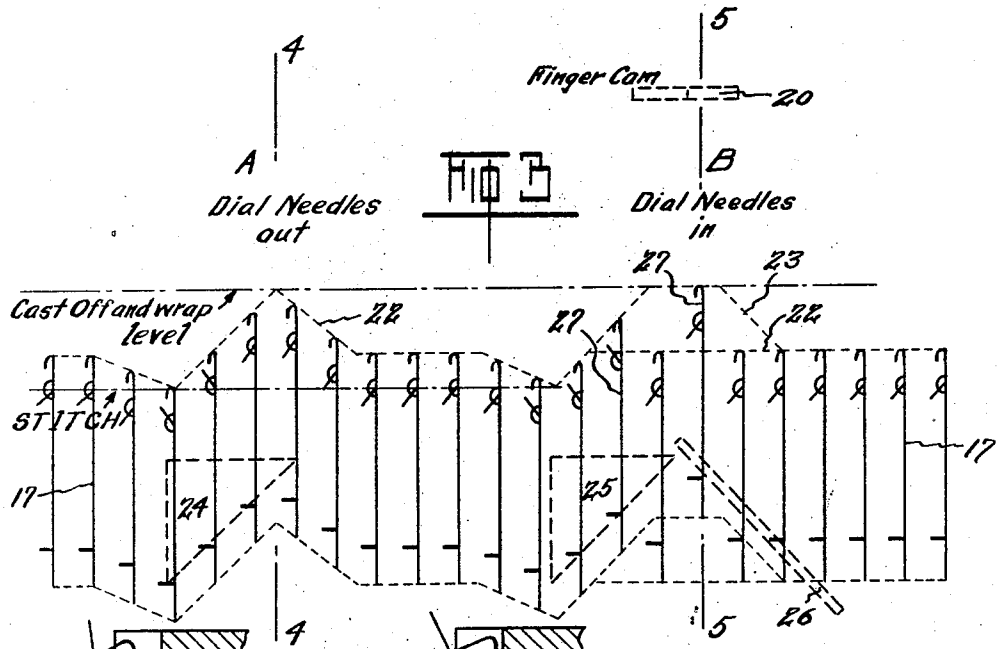


FIG 3

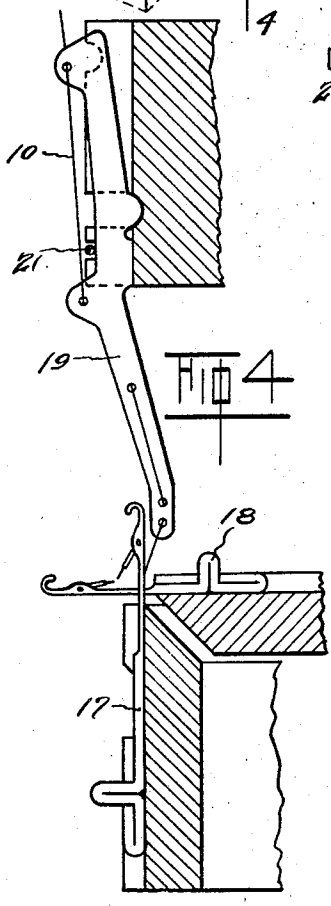


FIG 4

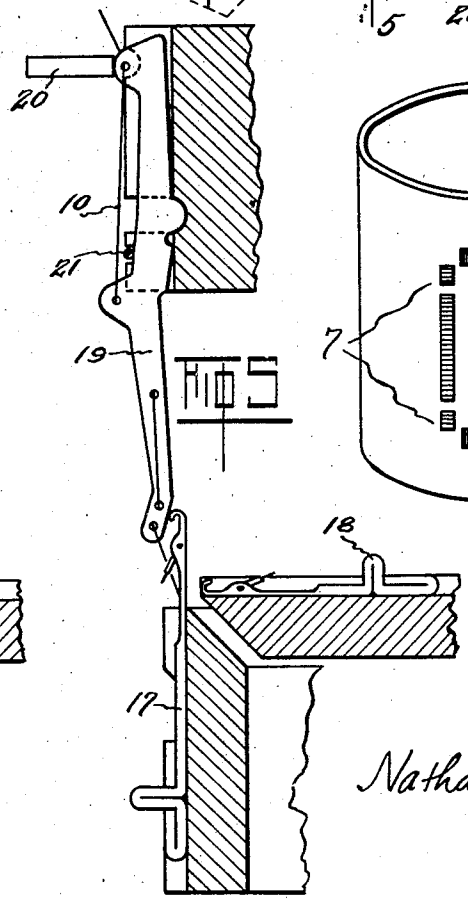


FIG 5

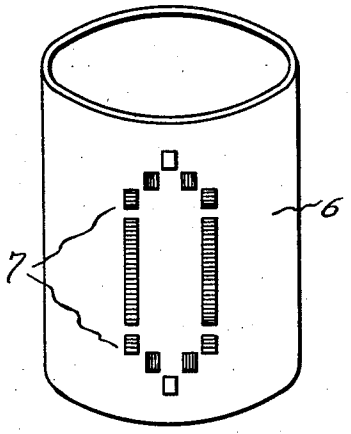


FIG 2

INVENTOR.

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Patented Nov. 21, 1933 1,936,024

UNITED STATES PATENT OFFICE

1,936,024

TUBULAR RIB FABRIC

Nathan Levin, Trenton, N. J., assignor to H. Brinton Company, Philadelphia, Pa., a corporation of Pennsylvania

Application May 29, 1931. Serial No. 541,016

11 Claims. (Cl. 66—201)

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 plain 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 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, 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 the knitting off or knocking over level where the old stitches of the weft body yarn 11 (Fig. 1)

are knitted off and new stitches 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 stitch 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 onto feed A where regular rib knitting takes place on all the needles. At feed B the dial needles are in 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 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 longer 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.

It will be understood that under the term "body yarn" I intend to include two or more yarns knitted simultaneously after the manner of a single yarn and that the term "single yarn stitches" is intended to cover situations where two or more yarns are knitted simultaneously in like manner. An example of such practice as I refer to is found in that common method of reinforcing by adding one or more auxiliary yarns to a main body yarn and knitting them all together, instead of using a single heavy yarn in heels and toes or the like.

I claim:

1. A seamless tubular knit rib fabric having outside plain and inside rib wales, said fabric being made of a body yarn and of other yarns for certain of said plain wales, said plain and rib wales comprising a succession of interknitted single yarn stitches, certain of the stitches of said certain plain wales and all the stitches of the other plain wales as well as all the stitches of the rib wales being formed of the body yarn, the remaining stitches of the said certain plain wales being formed of said other yarns, said other yarns floating past the said certain of the stitches of said certain plain wales.

2. A seamless tubular knit rib fabric having outside plain and inside rib wales, said fabric being made of a body yarn and of other yarns for certain of said plain wales, said plain and rib wales comprising a succession of interknitted single yarn stitches, certain alternate stitches of said certain plain wales and all the stitches of the other plain wales as well as all the stitches of the rib wales being formed of the body yarn, the intervening stitches of the said certain plain wales being formed of said other yarns, said other yarns floating past the said certain alternate stitches of said certain plain wales.

3. A seamless tubular knit rib fabric having outside plain and inside rib wales, said fabric being made of a body yarn and of other yarns for at least one of said plain wales, said plain and rib wales comprising a succession of interknitted single yarn stitches, certain of the stitches of said plain wale and all the stitches of the other plain wales as well as all the stitches of the rib wales being formed of the body yarn, the remaining stitches of the said plain wale being formed of said other yarn.

4. A seamless tubular knit rib fabric having outside plain and inside rib wales, said fabric being made of a body yarn and of other yarns for at least one of said plain wales, said plain and rib wales comprising a succession of interknitted single yarn stitches, certain alternate stitches of said plain wale and all the stitches of the other plain wales as well as all the stitches of the rib wales being formed of the body yarn, the intervening stitches of the said plain wale being formed of said other yarn.

5. A seamless tubular knit rib fabric having outside plain and inside rib wales, said fabric being made of a body yarn and of other yarns for

certain of said plain wales, said plain and rib wales comprising a succession of interknitted single yarn stitches, said certain of the plain wales each containing a greater number of single yarn stitches formed of the body yarn and of the other yarns than do each of the rib wales formed of the body yarn, within a given length of fabric, whereby the stitches of the other yarns are forced to substantially cover the single yarn stitches of the body yarn in said certain wales.

6. A seamless tubular knit rib fabric having outside plain and inside rib wales, said fabric being made of a body yarn and of other yarns for certain of said plain wales, said plain and said rib wales comprising a succession of interknitted single yarn stitches, said certain of the plain wales each containing twice the number of single yarn stitches formed in alternate succession of the body yarn and of the other yarns as occur in each of the rib wales formed of the body yarn, within a given length of fabric, whereby the alternate single yarn stitches of the other yarns are forced to substantially cover the intervening single yarn stitches of the body yarn in said certain wales.

7. A seamless tubular knit rib fabric having outside plain and inside rib wales of stitches formed of a body yarn knitted in each wale in each of a succession of courses, and a design formed on the outside of the fabric composed of a plurality of other yarns formed into stitches containing design yarn only, said design yarn stitches being interposed between successive stitches of the body yarn in a wale.

8. A seamless tubular knit rib fabric having outside plain and inside rib wales of stitches formed of a body yarn knitted into each wale in each course in an area of fabric, and a design formed on the outside of the fabric composed of a plurality of other yarns each formed by itself into stitches interposed between stitches of the body yarn in a wale, said design having an outline of which at least a portion is disposed at an angle with respect to said wales.

9. A seamless tubular knit rib fabric having outside plain and inside rib wales of stitches formed of a body yarn knitted in each wale at each course in an area of fabric, and a design formed on the outside of the fabric composed of a plurality of other yarns respectively individual to outside plain wales and formed into stitches interposed between stitches of the body yarn in their respective wales, said last-named stitches not including concatenated loops of body yarn.

10. A seamless tubular knit rib fabric having outside plain and inside rib wales of stitches formed of a body yarn, and a design formed on the outside of the fabric composed of a plurality of other yarns formed into design stitches between successive walewise stitches of the body yarn said design stitches containing pattern yarn only.

11. A seamless tubular rib fabric comprising successive courses of body yarn interknitted to form rib wales and plain wales, certain of the plain wales each containing more plain stitches per unit of length of the fabric than the number of courses of body yarn in such unit of length, the additional stitches in said plain wales being formed from auxiliary yarns each individual to a wale.

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