

Jan. 12, 1937.

F. M. TANSKI

2,067,739

KNITTED FABRIC AND METHOD OF MAKING THE SAME

Filed July 1, 1936

5 Sheets-Sheet 1

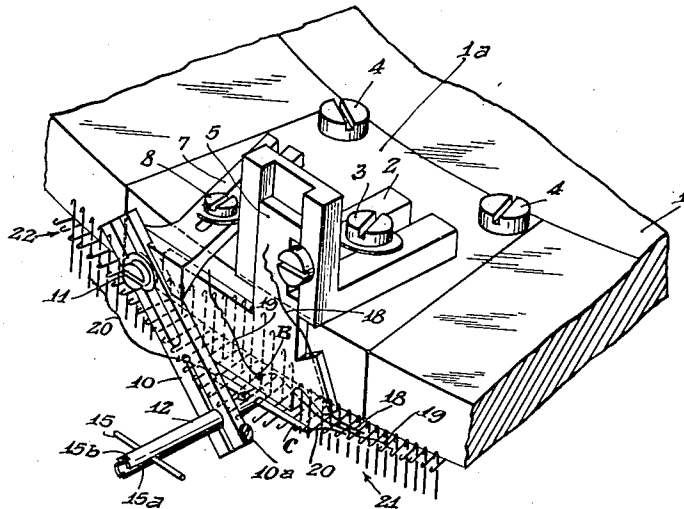


Fig. 1

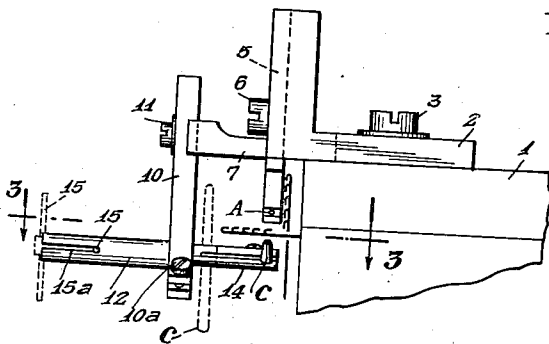


Fig. 2

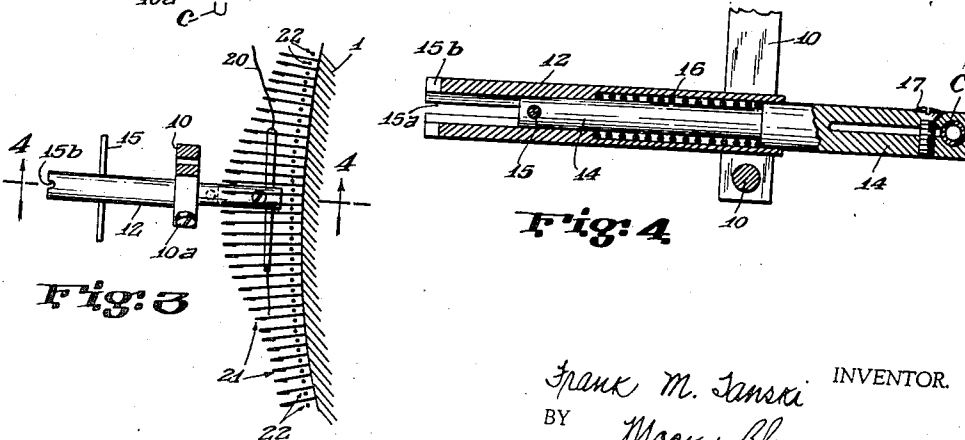


Fig. 3

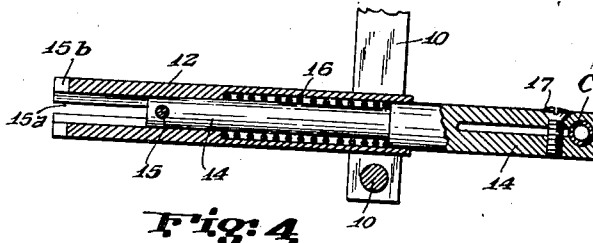


Fig. 4

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5 Sheets-Sheet 2

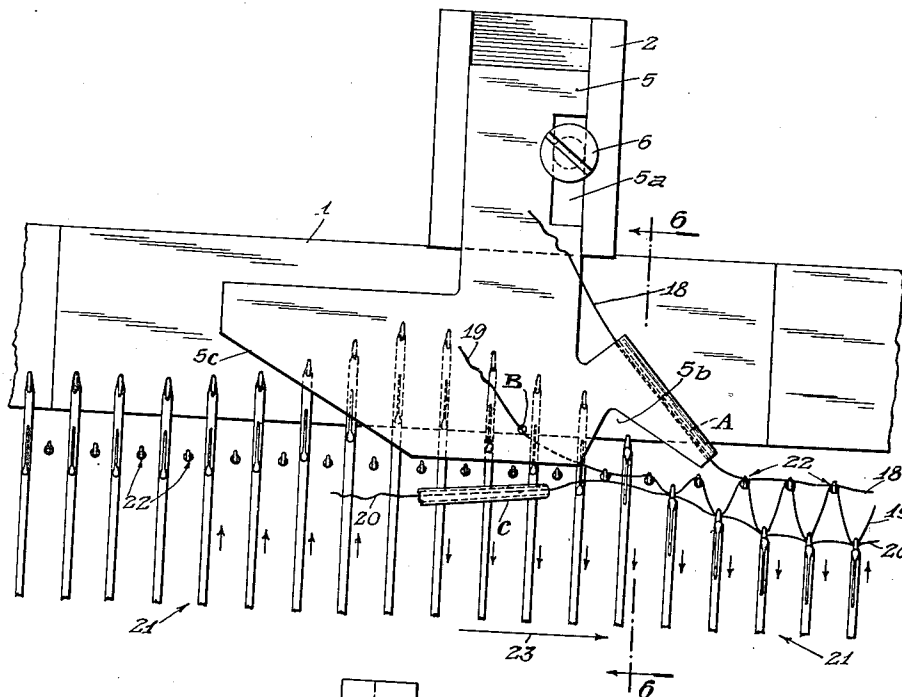


Fig: 5

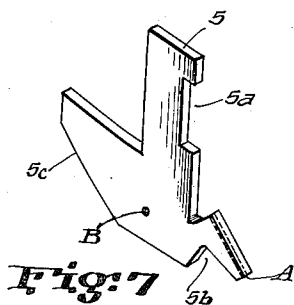


Fig: 7

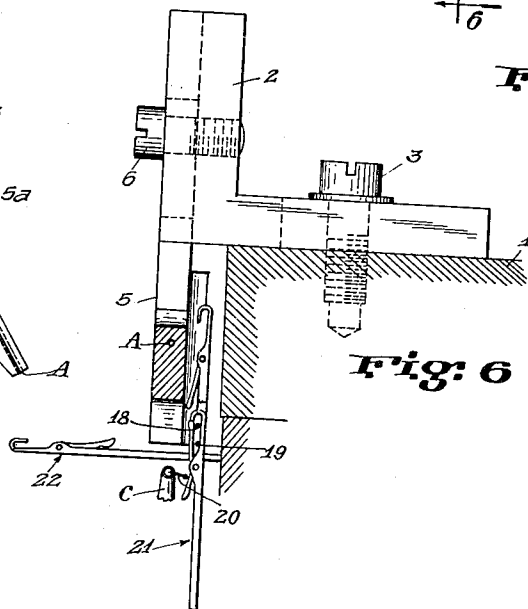


Fig: 6

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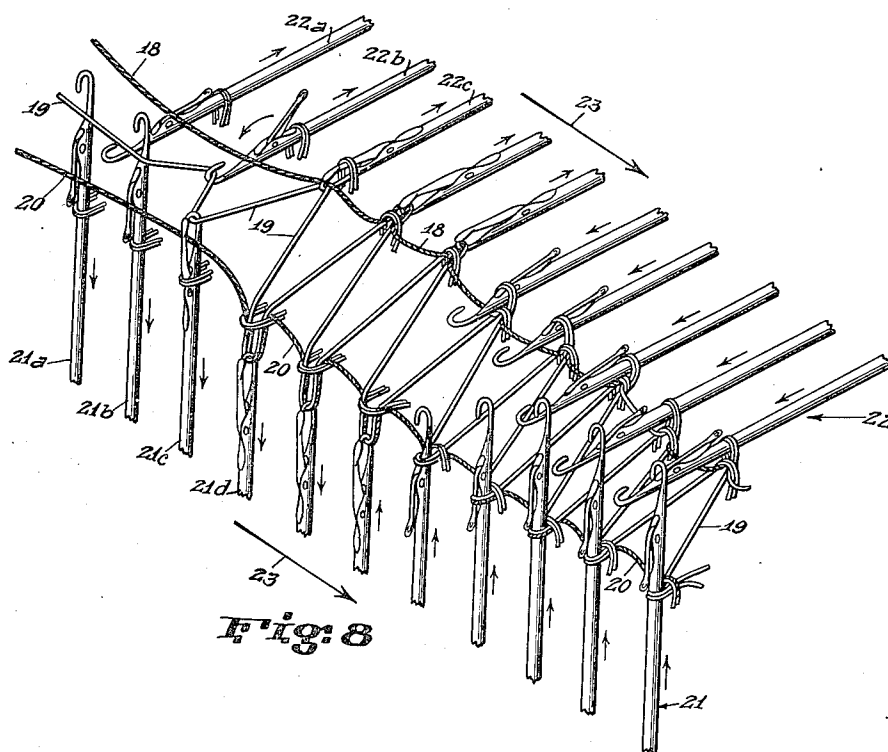
F. M. TANSKI

2,067,739

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5 Sheets-Sheet 3



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5 Sheets-Sheet 4

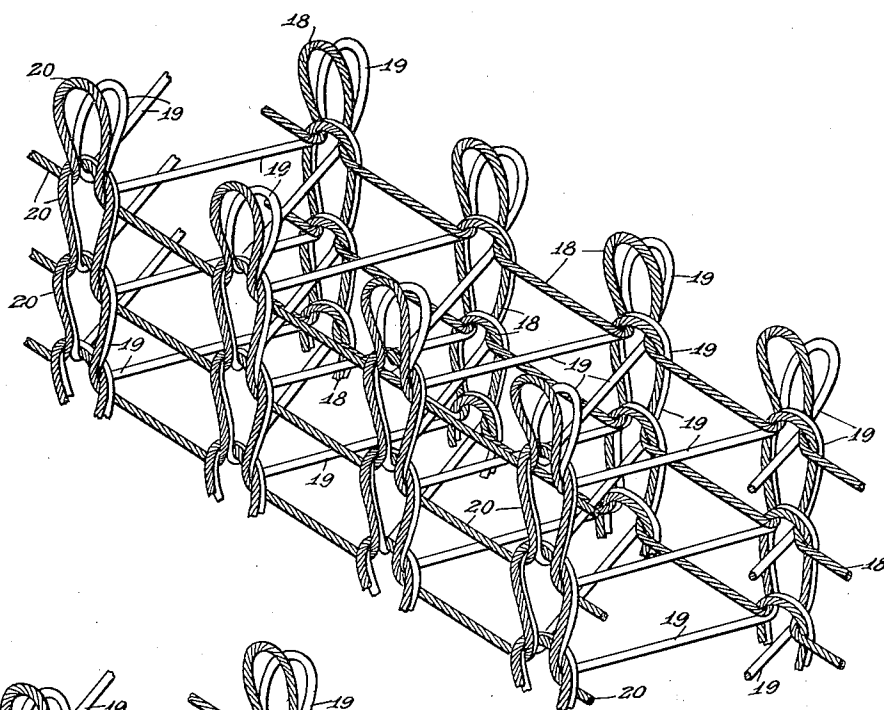


Fig: 9

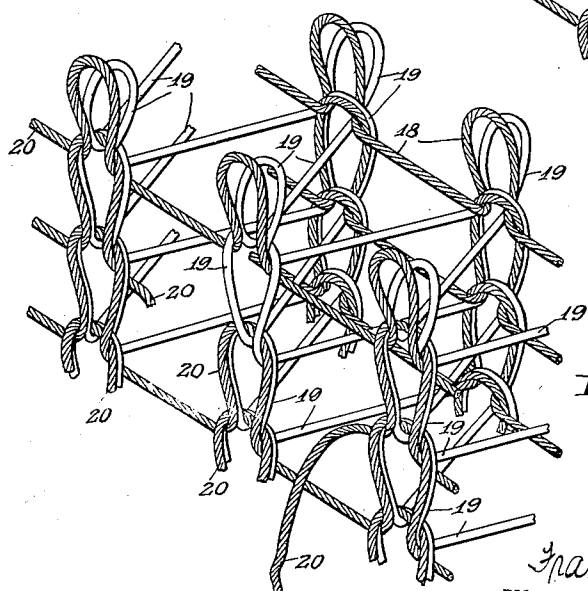


Fig: 10

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2,067,739

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5 Sheets-Sheet 5

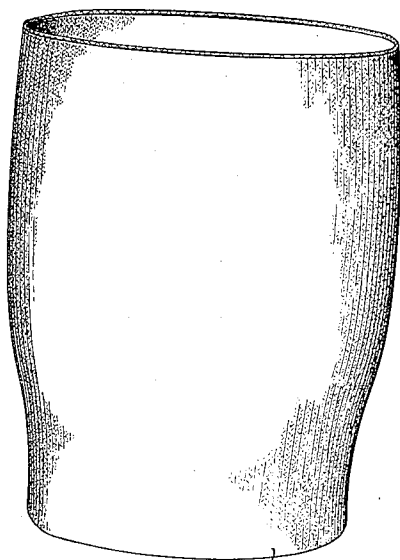


Fig. 13^D

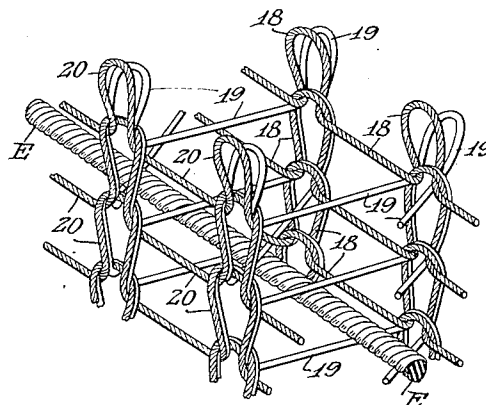


Fig. 14

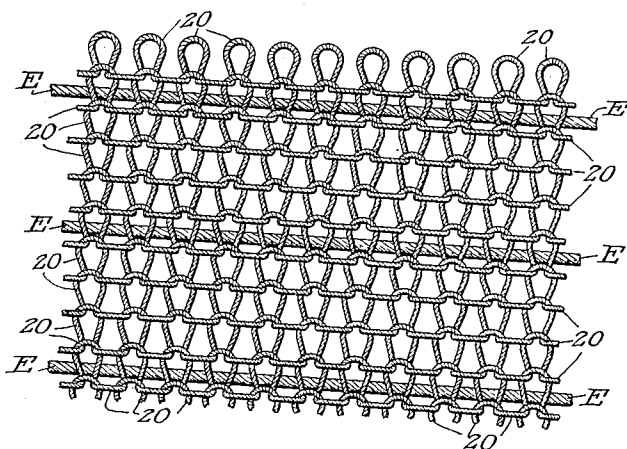


Fig. 12

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UNITED STATES PATENT OFFICE

2,067,739

KNITTED FABRIC AND METHOD OF
MAKING THE SAME

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poration of New York

Application July 1, 1936, Serial No. 88,316

5 Claims. (Cl. 66—196)

This invention relates to a new and improved knitted fabric, to a new and improved method of making the same, and to a new and improved mechanism for making the same.

One of the objects of the invention is to provide a non-run knit fabric.

Another object of the invention is to make a knit fabric, in which the loops are inter-knitted. For the purpose of interconnecting said loops, I may use an additional thread but the invention is not limited to the use of such additional thread.

Another object of the invention is to provide an elastic knit fabric which may be made wholly or in part from elastic yarn, said yarn being made of rubber which is covered with one or more helical windings of silk or cotton or the like, this yarn being well known on the market as "Lastex".

Another object of my invention is to provide an improved elastic fabric which is particularly useful in making women's undergarments of the girdle type, although the invention may be used for various other purposes.

Another object of the invention is to provide mechanism for making the improved fabric, which involves simple attachments to a well known type of knitting machine.

Another object of the invention is to provide an improved fabric of the type which may have contrasting color effects at the opposite sides thereof.

Other objects of the invention will be set forth in the following description and drawings which illustrate a preferred embodiment of the mechanism which may be used for practicing the invention, it being understood that the above statement of the objects of the invention is intended to generally explain the same without limiting it in any manner.

Fig. 1 is a partial perspective view of a well known type of knitting machine to which the improved attachments have been applied.

Fig. 2 is a side elevation of the attachments which can be applied to a standard type of knitting machine, and which may replace the yarn-feeding attachments which are now in use.

Fig. 3 is a sectional view on the line 3—3 of Fig. 2.

Fig. 4 is a sectional view on the line 4—4 of Fig. 3.

Fig. 5 is a partial front elevation showing the attachment which is used for feeding two yarns to the cylinder needles and the dial needles of a circular knitting machine, the other attachment not being shown in this view, for con-

venience. The attachment which is not shown in Fig. 5 is used for feeding a single yarn to the cylinder needles only.

Fig. 6 is a sectional view on the line 6—6 of Fig. 5.

Fig. 7 is a perspective view of the attachment which is illustrated in Fig. 5 and which feeds two yarns to the cylinder needles and to the dial needles.

Fig. 8 is a diagrammatic view which shows the cylinder needles and the dial needles of a standard circular machine, and it also shows how the yarns are supplied to these needles, in order to knit the improved fabric.

Fig. 9 is a general diagrammatic perspective view of the completed fabric, it being understood that the loops are shown widely separated from each other, in order to illustrate the construction of the fabric more clearly.

Fig. 10 illustrates how the non-run properties of the fabric are secured, when a yarn is broken.

Fig. 11 is a perspective view showing how elastic threads can be inserted into the fabric.

Fig. 12 is a front elevation of the fabric shown in Fig. 11.

Fig. 13 shows a tubular blank of the type used in making a girdle.

Referring to Fig. 1, this shows the usual top stationary plate 1 of any suitable circular knitting machine. An angular bracket 2 is fixed to the plate 1, by means of a clamping screw 3. The base of the bracket 2 is forked, and the head of the clamping screw 3 engages the top surfaces of the legs of this fork.

If desired, the plate 1 can have a removable section 1a to which the bracket 2 is connected. Said removable section 1a can be fixed to the plate 1 by means of clamping screws 4, or the like. The vertical surface of the bracket 2 is provided with a vertical recess, in which the first attachment 5 can be vertically adjusted.

The first attachment 5 can be held in vertically adjusted position by means of a clamping screw 6.

The bracket 2 can be horizontally adjusted relative to the plate 1 or relative to the section 1a, by means of the clamping screw 3.

The attachment 5 is provided with a recess 5a in one wall thereof, in order to permit the vertical adjustment of said attachment 5.

Referring to Fig. 7, the attachment 5 is provided with a first and inclined and tubular yarn guide A and with a second transverse yarn guide B. The yarn guide B is merely a transverse opening through the member 5, which can be made of any suitable metal or other material.

As shown in Fig. 7, the attachment 5 is provided with an angular recess 5b in its bottom surface, and it is also provided with an inclined wall 5c at its bottom, for purposes which will be later described.

The second attachment, which feeds a third additional yarn, is connected to the removable section 1a by means of a forked bracket 7. A clamping screw 8 adjustably connects the bracket 7 to the section 1a so that said bracket 7 may be horizontally or radially adjusted. Likewise it is to be noted that the bracket 2 can be radially adjusted, in addition to being horizontally adjusted.

The bracket 7 is provided with a vertical face which is in front of the front face of the plate 1, and a forked bar 10 is adjustably connected to said front face of the bracket 7, by means of a clamping screw 11. Said clamping screw 11 permits the sliding adjustment of the bar 10 relative to the bracket 7, in the direction of the longitudinal axis of said bar 10, which is shown in Fig. 1.

The forked upper end of the bar 10 is mounted in a suitable recess of the front face of the bracket 7, so that the bar 10 always has the same angle relative to the bracket 7.

The lower end of the bar 10 is of split and resilient construction, and for this purpose the bar 10 can be made of suitable metal. A metal tube 12 is held between the legs of the lower end of the bar 10, and said legs are provided at their inner faces with suitable substantially semi-circular recesses, in order to receive and clamp the tube 12.

A clamping screw 10a forces the legs at the bottom end of the bar 10 towards each other so as to exert the necessary clamping pressure upon the tube 12.

By loosening the screw 10a so as to allow the adjacent legs of the bar 10 to separate sufficiently, the tube 12 can be adjusted relative to the bar 10, in the direction of the longitudinal axis of the tube 12.

The third yarn guide C is a metal tube, which is held in the adjacent split portion of a plunger 14, which is shown in Fig. 4. This plunger 14 has a snug sliding fit within the tube 12.

As shown in Figs. 1 and 4, one end of the plunger 14, which may be designated as the outer end thereof, is provided with a transverse pin 15 which fits slidably in two longitudinal recesses which are formed in the wall of the tube 12, as shown in Fig. 1. Hence the plunger 14 can slide within the tube 12, but without turning relative to the tube 12. However, the plunger 14 can be moved a sufficient distance relative to the tube 12, until the pin 15 leaves said slots 15a. The plunger 14 can then be turned relative to the tube 12 and the pin 15 can be caused to enter slots 15b, which are located equally between the slots 15a so that the plunger can then be held in outer position.

As shown in Fig. 4, the plunger 14 is of step-shape so that it has two portions of different transverse diameter.

A spring 16 is located between a shoulder of the tube 12 and the reduced portion of the plunger 14. This spring 16 normally forces the plunger 14 to a position in which the pin 15 contacts with the inner ends of the slots 15a, this position being shown in Fig. 1.

As shown in Fig. 4, the inner end of the plunger 14 is of split construction and the third yarn guide C is clamped between the adjacent legs of

the plunger 14. A screw 17 forces the two legs of the plunger towards each other so as to exert the necessary clamping pressure upon the third yarn guide C.

A yarn 18 is supplied through the yarn guide A, a yarn 19 is supplied through the yarn guide B, and a yarn 20 is supplied through the yarn guide C. All these yarns may be of any type, and any combination of yarns can be utilized.

Fig. 5 shows how the yarn 19 is passed through guide B, and then fed laterally to the needles 21 and 22. This is also shown in Fig. 8.

In the preferred embodiment, the yarn 20 is a silk yarn which is of the ordinary type and which does not have any rubber therein. In one embodiment, a single elastic yarn 19, made of covered rubber, can be utilized. If desired, the yarns 18, 19 and 20 may be yarns of ordinary textile material such as cotton or silk, and elastic rubber yarns may be interlaced in the well-known manner between the courses which are knit by means of said textile yarns. In such case the elastic yarn would be supplied from a fourth spool wholly independently of the supply of yarns 18, 19 and 20.

One of the advantages of the improved fabric is that it lies smooth when elastic yarn is thus combined with the fabric, so that the fabric does not curl so as to form uneven waves or corrugations. This is particularly useful in making a smooth seamless tubular knit fabric.

Figs. 11 and 12 show an elastic fabric of this type having the fourth elastic yarn E. Fig. 13 shows a blank D of the type which is used for making a woman's undergarment of the girdle type. This blank is smooth and seamless and tubular.

The invention is therefore capable of numerous modifications depending upon the type of material which is to be knit.

The threads 19 and 20 may be of different colors, so as to provide for a two color effect at the opposite faces of the fabric, and in such case the thread 18 may have a color which is either the same as 19 or 20 or the thread 18 may have a third color.

Referring to Fig. 8 for convenience, this shows the cylinder needles 21 and the radial dial needles 22. The cylinder needles 21 are arranged in the usual manner so that they reciprocate vertically and parallel to each other, and the radial dial needles 22 are arranged in the usual manner, so that they can reciprocate to and fro along radii which diverge from a common center.

While Fig. 8 shows the dial needles 22 more or less parallel to each other, this is merely for convenience of illustration, as the attachment can be employed in connection with the ordinary standard circular knitting machine.

In the particular embodiment shown the needles have latches of the usual type. The machine is assumed to turn counterclockwise when viewed from above, this being indicated by the arrows 23 in Fig. 8.

As shown in Fig. 1 and on a larger scale in Fig. 8, and assuming that the machine operates in the counterclockwise direction previously specified, the yarns 19 and 20 are supplied to the needles at about the same time, and the yarn 18 is supplied in advance of the yarns 19 and 20.

The yarn 18 is supplied only to the dial needles 22. The yarn 19 is supplied both to the dial needles 22 and the cylinder needles 21. The

yarn 20 is supplied only to the cylinder needles 21.

Fig. 8 shows the yarn 19 supplied to the cylinder needles 21a and 21b. The yarn 20 passes in front of the down-turned latches of said cylinder needles 21a and 21b and said yarn 20 is located between the hook and the latch of the cylinder needle 21c.

As shown in Fig. 8 the dial needle 22a has been moved outwardly so that it is in an operative position relative to the cylinder needle 21b. The cylinder needle 21a is not yet in operative position relative to the respective dial needle.

The yarn 19 passes over the dial needle 22a and it is engaged by the hook of the dial needle 22b. Said yarn is held between the hook and the latch of the dial needle 22c which has been moved sufficiently towards the common center of said dial needles, so that the old loop has closed the latch of said dial needle 22c.

The cylinder needle 21d has been lowered sufficiently so as to pull the new loop which has been formed by the yarn 20 over the old loop, said old loop being indicated on the needles 21a, 21b and 21c, and also to close the latch of said needle 21d in the well known manner. Fig. 8 thus illustrates the sequence of the operations in knitting the fabric, from the left-hand side of Fig. 8 to the right-hand side thereof.

Considering cylinder needle 21b and dial needle 22a, the third yarn 19 is about to be engaged by the hooks of said needles, and it is closer to the inner ends of the hooks of said needles, than the yarns 20 and 18. Considering cylinder needle 21c and dial needle 22b, the latch of cylinder needle 21c has been closed so as to lock the yarns 20 and 19, while the latch of dial needle 22b is still open. The third yarn 19 has been formed into zig-zag legs.

Considering cylinder needle 21d and dial needle 22c, the old loop on cylinder needle 21d has been cast off and dial needle 22c still retains its old loop.

It is clear that yarn 19 can now be under greater tension than yarn 20 or 18 and that the zig-zag legs of yarn 19 exceed in length, the lengths of the loops which are formed on the respective series of needles.

Since, as previously stated, the yarn 20 is supplied to the needles under little or no feeding tension, and since the yarns 18 and 19 are supplied under equal feeding tensions, it is clear that during the knitting process, the yarn 19 is subjected to greater tension than either of the other yarns.

The zig-zag legs which are formed in the yarn 19, vary in length as shown in Fig. 8, and the longest legs exceed the lengths of the loops which are formed in the fabric.

Hence the yarn 20 forms loops upon one face of the fabric. Likewise in the preferred embodiment the loops which are formed by means of the yarn 20 are coupled with loops formed by the yarn 19 so as to form two series or layers of loops from said two yarns, namely, the yarns 19 and 20.

Likewise the dial needles operate to form two series or layers of loops from the two yarns fed thereto, namely, the extra yarn for the loops of each face of the fabric.

Referring to Fig. 9 and assuming that a seamless tube of fabric is being knitted, the inner face of the tube would be the rear face of the fabric which is shown in Fig. 9. One of the principal purposes of the invention is to provide a seamless tubular knitted fabric, of the kind which is used for making girdles and other garments. In such tubular fabrics the yarn 19 is at the inner surface of the inner face of the tube. The yarn 20 is at the outer surface of the outer face of the tube and the yarn 19 is practically invisible at the outer face of the tube.

The yarn 19 may be under higher tension than the other yarns, during the knitting operation, so that the loops formed by yarn 19 are located behind the loops formed by yarn 18. Thus formation is facilitated by the lateral feed of yarn 19. In the finished fabric the legs of yarn 19 which are between the loops of said yarn, are under substantial tension. The loops at the front and the rear of the fabric are arranged in aligned rows. The legs of yarn 19 which are between the loops are inclined to each other.

Referring to Fig. 10, if the yarn 20 is ruptured, or even if a hole is made in a fabric which ruptures the yarns 18, 19 and 20, the run or hole cannot spread because the yarn 19 is under high tension so that the loops at the front face and at the rear face of the fabric are pressed together so tightly as to cause a frictional locking effect whereby the loops cannot be unraveled one from the other.

It will be noted that the improved fabric is preferably a ribbed fabric. For example, if it is attempted to pull out the broken yarn 20 in Fig. 10, it is necessary to pull out said yarn from the next loop. In said next loop, the yarn 20 is in front of yarn 19, and said loop is pressed firmly against the corresponding rear loop so that the yarn 19 of the unbroken loop frictionally holds the yarn 20 of the unbroken loop.

As shown in Figs. 9 and 10, the fabric has four layers of loops. Successive loops of the third yarn 19 are connected by transverse portions of said third yarn 19. In the preferred fabric the loops of the layers are arranged in aligned rows, so that each vertical row of front loops is aligned with the corresponding vertical row of rear loops.

It will be noted that some of the loops of the yarn 19, namely, the loops in the second layer, are located between the loops of the first yarn 20 and the loops of the second yarn 18.

For convenience the front layer shown in Fig. 9 may be designated as the first layer. The loops of the second yarn 18 in the third layer are located between the loops of the yarn 19 in the second layer, and the loops of the yarn 19 in the fourth layer.

In its broader aspect, the loops of yarns 20 and 18 could be interknit without using the third yarn 19.

In the completed fabric the third yarn 19 is under tension so that the layers of loops are firmly pressed against each other.

The invention can be used in connection with the manufacture of all types of circular knit fabrics, so that it is not limited to the manufacture of elastic knit fabrics. The invention can be utilized for manufacturing the blanks for girdles and corselettes and also for manufacturing bathing suits, knitted outer-wear and underwear, knitted upholstery cloth and the like.

The invention also includes fabrics which are made wholly from non-rubber thread so that the entire fabric can be made of silk or cotton or wool or from any combination of yarns which are

not elastic save to the extent that yarns made of such textile materials have a certain inherent elasticity.

The loops must be sufficiently fine in order to produce a self-locking effect if a hole is formed in the fabric. If the loops are too long, the fabric will not be self-locking. In making a tubular fabric with the use of a rayon face yarn, and two cotton yarns, I have secured the self-locking effect by having from 26 loops to 28 loops per inch in the length or height of the fabric in its width, the tubular fabric may have ten loops to fourteen loops per inch. The gauge of the rayon yarn was No. 300 denier, and the gauge of each cotton thread was 36/2, American system.

This produces a fabric which is much tighter than according to ordinary practice, while using yarns of said gauges. In ordinary practice, there would be about 18 loops per inch in the height or length of the fabric, and about 8 loops per inch in the width of the fabric.

These figures can be varied, but the stitch must be sufficiently fine and tight. The yarn 20 is supplied to the needles under little or no tension in the feed. The yarns 18 and 19 are supplied under equal and normal tension. However, since the loops of the yarn 19 are longer than the loops of the other yarns, since the loops of yarn 19 go back and forth, the final fabric has the loops of yarn 19 pulled tight so that they knot the loops of yarns 18 and 20. Hence even if the three yarns are broken, the break stops at the next loop.

The machine which may be used with the attachment is known in the trade as the "Wildman rib machine". This machine knits a seamless tube of fabric, which can then be fashioned to make a girdle or other garment. I can use any style of machine which is used for knitting a ribbed fabric.

I have shown a preferred embodiment of my invention but it is clear that numerous changes and omissions could be made without departing from its spirit.

I claim:

1. A method of forming a knit fabric which consists in forming a first layer of loops and a second layer of loops from separate yarns, and simultaneously forming a third layer of loops and a fourth layer of loops from a third yarn, the third layer of loops being interknit with the first layer and being located between the first layer and the second layer, the fourth layer of loops being interknit with the second layer, the second layer of loops being between the third layer and the fourth layer.

2. A smooth seamless tubular knit fabric comprising four layers of loops, said loops being formed from a first yarn and a second yarn and a third yarn, the loops of the first yarn being confined to one of said layers, the loops of the second yarn being confined to a second layer, the loops of the third yarn forming the other two layers, successive loops of the third yarn being connected by transverse portions of said third yarn, said loops being sufficiently fine relative to the

gauge of the yarns and the loops of the third yarn being sufficiently tight and under greater tension than the loops of the other yarns, so as to knot said loops even if said three yarns are severed in a part of said knit fabric, so as to make said fabric non-running.

3. A smooth seamless tubular knit fabric comprising four layers of loops, said loops being formed from a first yarn and a second yarn and a third yarn, the loops of the first yarn being confined to one of said layers, the loops of the second yarn being confined to a second layer, the loops of the third yarn forming the other two layers, successive loops of the third yarn being connected by transverse portions of said third yarn, said loops being sufficiently fine relative to the gauge of the yarns and the loops of the third yarn being sufficiently tight and under greater tension than the loops of the other yarns so as to knot said loops even if said three yarns are severed in a part of said knit fabric so as to make said fabric non-running, said smooth seamless tubular knit fabric including elastic yarn and being elastic in the direction of said elastic yarn.

4. A method of knitting a fabric by means of a series of parallel and vertically disposed cylinder needles and a second series of radial dial needles located in a horizontal plane and with the use of a first yarn and a second yarn and a third yarn, which consists in feeding the first yarn to the cylinder needles, feeding the second yarn to the dial needles, feeding the third yarn both to the cylinder needles and to the dial needles, forming intermeshing loops from the first yarn and the third yarn by means of the cylinder needles, also forming intermeshing loops from the second yarn and the third yarn by means of the dial needles, while feeding the third yarn to the cylinder needles above the first yarn, and while feeding the second yarn to the dial needles behind the third yarn, and while causing the outer ends of the hooks of the cylinder needles and of the dial needles to engage the third yarn prior to engaging the other yarns.

5. A method of knitting a fabric by means of a series of parallel and vertically disposed cylinder needles and a second series of radial dial needles located in a horizontal plane and with the use of a first yarn and a second yarn and a third yarn, which consists in feeding the first yarn to the cylinder needles, feeding the second yarn to the dial needles, feeding the third yarn both to the cylinder needles and to the dial needles, forming intermeshing loops from the first yarn and the third yarn by means of the cylinder needles, also forming intermeshing loops from the second yarn and the third yarn by means of the dial needles, while feeding the third yarn to the cylinder needles above the first yarn, and while feeding the second yarn to the dial needles behind the third yarn, and while causing the outer ends of the hooks of the cylinder needles and of the dial needles to engage the third yarn prior to engaging the other yarns, and while casting the loops off the cylinder needles prior to casting the loops off the dial needles.

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