Nov. 13, 1962 M. H. FAUST ET AL 3,063,271

METHOD OF KNITTING FABRIC

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FIG. 1

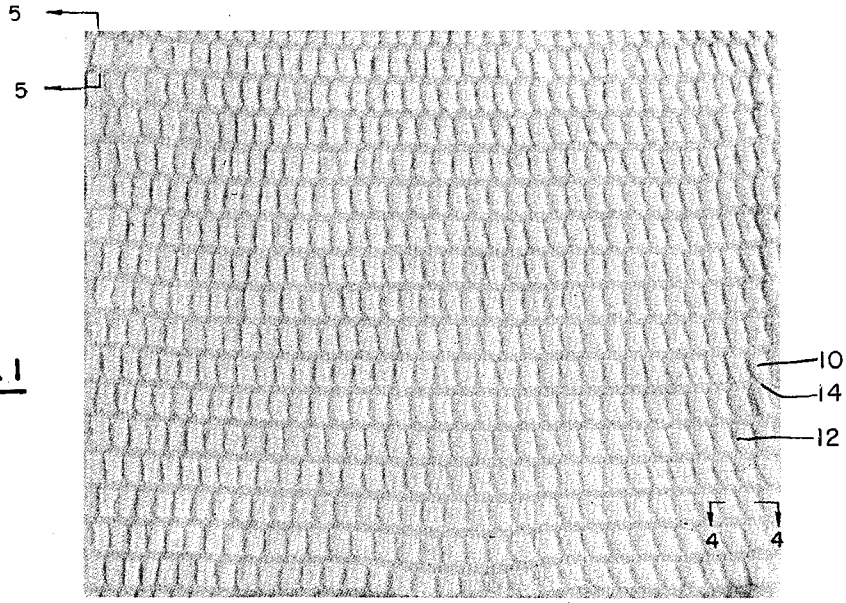
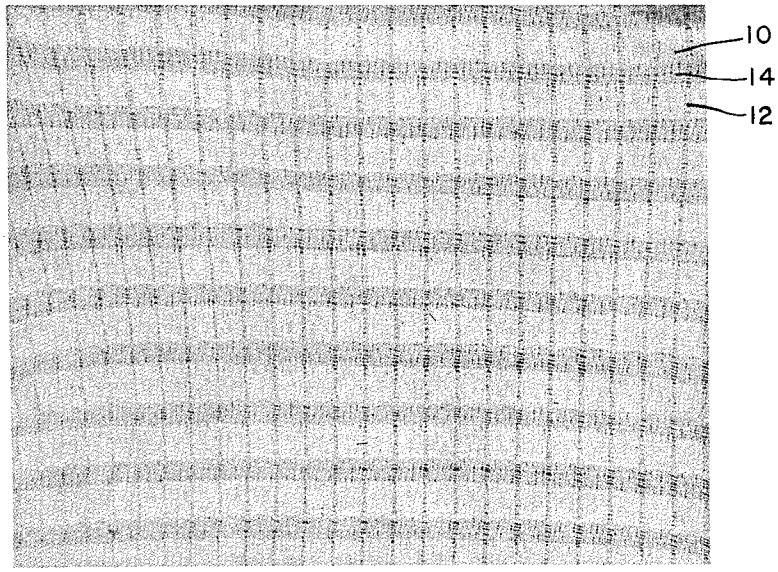


FIG. 2



INVENTORS
MARTIN H. FAUST
FRANK STEVENSON
Louis Medko
ATTORNEY

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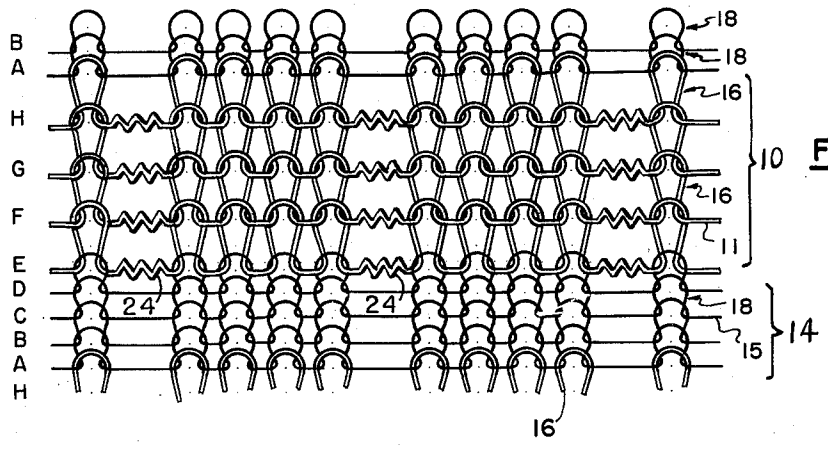


FIG. 3

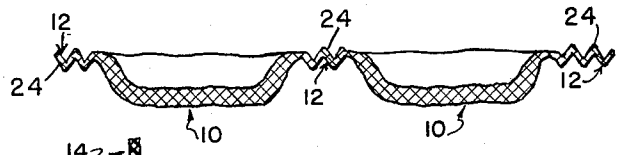


FIG. 4

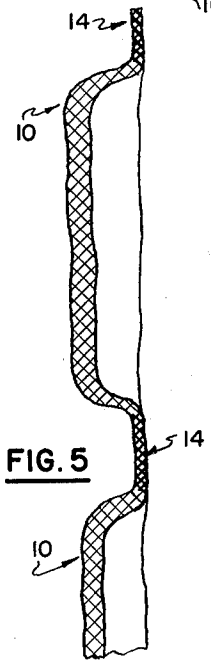


FIG. 5

INVENTORS
MARTIN H. FAUST
FRANK STEVENSON

BY Louis Necho

ATTORNEY

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3,063,271

METHOD OF KNITTING FABRIC

Martin H. Faust, Reading, and Frank Stevenson, West Lawn, Pa., assignors to Penn Dale Knitting Mills, Sinking Spring, Pa., a corporation of Pennsylvania

Filed Oct. 3, 1960, Ser. No. 59,954
3 Claims. (Cl. 66—82)

This invention relates to a method of making a flat-knit fabric.

One object of the invention is to produce a fabric which has an attractive appearance, which can be made in various patterns, which has improved stretching and contracting characteristics, and which, when relaxed, will have the feel and the appearance of increased bulk and warmth.

The full nature of the invention will be understood from the following specification and accompanying drawings in which:

FIG. 1 is a photographic view showing the appearance of the fabric when it is relaxed.

FIG. 2 is similar to FIG. 1, but shows the fabric when it is stretched.

FIG. 3 is an enlarged diagrammatic view of a fabric knit according to the method of this invention.

FIG. 4 is an enlarged and diagrammatic view looking in the direction of line 4—4 on FIG. 1.

FIG. 5 is similar to FIG. 1, but looking in the direction of line 5—5 on FIG. 1.

The fabric illustrated in FIG. 1 is knit on a spring beard flat knitting machine and is formed to knit, alternating areas **10** and **14**, and ladder, or non-knit areas **12**.

Areas **10** may be formed of a highly stretchable, or of a non-stretchable, natural or synthetic yarn. In the preferred embodiment, areas **10** are knit of a highly stretchable synthetic yarn **11** and are knit under minimum tension, or a tension just sufficient to draw the yarn through the needles, but not sufficient appreciably to stretch the yarn. Areas **14** are formed of an elastic yarn **15**, such as rubber, and are knit under tension sufficient appreciably to stretch the yarn.

As best shown in FIG. 3, the yarn **11** used in knitting areas **10** is preferably of a larger denier than yarn **15** which is used in knitting areas **14**. The difference in denier and the difference in tension combine to produce relatively large and loose stitches **16** in areas **10** and relatively small and tight stitches **18** in areas **14**. Since the number of stitches **16** in each area **10** is equal to the number of stitches **18** in each area **14**, areas **10** will bulge, and will be somewhat loose and gathered, or puckered, while areas **14** will be tight and will lie flat. In other words, areas **10** will be more open, looser and thicker than areas **14**, as diagrammatically illustrated at **24** in FIG. 4.

It has heretofore been proposed, for one purpose or another, to omit stitches at intervals, but, as far as we are aware, this has always been done by omitting a needle at the point where it was desired to omit a stitch. Omitting a needle will produce the non-knit, or ladder, areas **12**, but, in that event, the yarns **11** and **15** would be stretched relatively taut between course-wise adjacent stitches **16**, **16** and **18**, **18**, respectively. This seriously limits the stretchability of the fabric.

According to our invention, instead of omitting a needle, we remove, or permanently close, the beard of the selected needle so as to prevent it from forming a stitch. By this arrangement, a length of yarn, **11** or **15**, will be drawn about the shank of the needle, the beard of which is closed, the same as if a stitch were to be formed. But, since no stitch is formed, the length of yarn **11** drawn will be gathered or crinkled as diagrammatically

shown at **24** in FIG. 3, and will be available to impart increased stretchability to the finished fabric. This is due to the fact that when the elastic yarn **15** is stretched (upon stretching of the fabric), the excess yarn **11** which is drawn about the shank of a needle whose beard is closed, will, by straightening out the kinks, provide elongation in addition to such true stretching as the yarn is capable of. In the absence of a needle shank to draw excess yarn, the yarn connecting adjacent stitches **16**, **16** will be much shorter and will limit the stretchability of the fabric to the real stretch factor built into yarn **15** by actual experience, which shows that a fabric knit with the beard of the needle closed is appreciably more stretchable than a similar fabric in which a needle is omitted altogether.

Since this invention resides primarily in removing or closing the beard of a spring beard needle, as distinguished from omitting the needle altogether, it is thought unnecessary to show, or to describe, a flat bed, spring beard needle knitting machine or its operation. It is thought sufficient to say that in carrying out the invention, it is merely necessary to permanently close the beards of selected needles, which any mechanic can do with a pair of pliers, or the like.

The stretchable yarn **11** used in forming stitches **16** may be like that disclosed in Garrou Patent No. 2,706,-389, or it may be of any other type now available on the market.

The shape and size of areas **10** and **14** may be varied by varying the number and arrangement of stitches **16** and **18** and by varying the denier of yarns **11** and **15** and the tensions under which the yarns are knit. Also, while we prefer to draw yarn **11** around the shank of a needle, the beard of which is closed, or removed, the essence of our invention structurewise resides in knitting predetermined areas of large denier and large and loose stitches, knitting other areas of tight stitches of elastic yarn and walewise alternating these areas with dropped stitches, Method-wise, our invention resides in drawing a length of yarn sufficient to form a large loose stitch but, since no stitch is actually formed, the yarn thus drawn will be longer than the yarn which would span ladder area **12** in the absence of a needle.

The particular fabric illustrated is formed as follows: The machine is prepared for operation by permanently closing, or by removing the beard of every sixth needle. Next, courses A, B, C, D are knit of elastic yarn **15** under relatively high tension. Next, courses E, F, G and H are knit, under minimum tension, of heavier denier, stretchable, or non-stretchable yarn, and so on. This process produces a fabric which will stretch twice as much, or more, than an identical fabric produced by omitting selected needles altogether.

As used in the specification and claims, "non stretch" means a yarn which has only that amount of stretch which is inherent in ordinary thread, such as rayon, or nylon, and "high stretch" means elastic yarn made of rubber or synthetic yarn of the type known as "Helanca" or of the type disclosed in Patent No. 2,706,389, aforesaid.

What we claim is:

1. The method of knitting a fabric on a flat knitting machine of a type which employs spring beard needles, which method includes the step of permanently closing the beards of selected needles at selected intervals in the bed of the machine, knitting a first group of courses under tension of a relatively low order, and knitting a second group of courses of an elastic yarn under tension of a relatively high order, the denier of the yarn used in knitting said first group of courses being heavier than the denier of the yarn used in knitting the second group of courses.

2. The method of knitting a fabric on a flat knitting machine of a type which employs spring beard needles, which method includes the step of permanently disabling the beards of selected needles at selected intervals in the bed of the machine,

knitting a first group of courses under tension of a relatively low order, and

knitting a second group of courses of the elastic yarn under tension of a relatively high order, the denier of the yarn used in knitting said first group of courses being heavier than the denier of the yarn used in knitting the second group of courses.

3. The method of knitting a fabric on a flat knitting machine of a type which employs spring beard needles, which method includes the step of removing the beards of selected needles at selected intervals in the bed of the machine,

knitting a first group of courses under tension of a relatively low order, and

knitting a second group of courses of the elastic yarn under tension of a relatively high order, the denier of the yarn used in knitting said first group of courses being heavier than the denier of the yarn used in knitting the second group of courses.

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