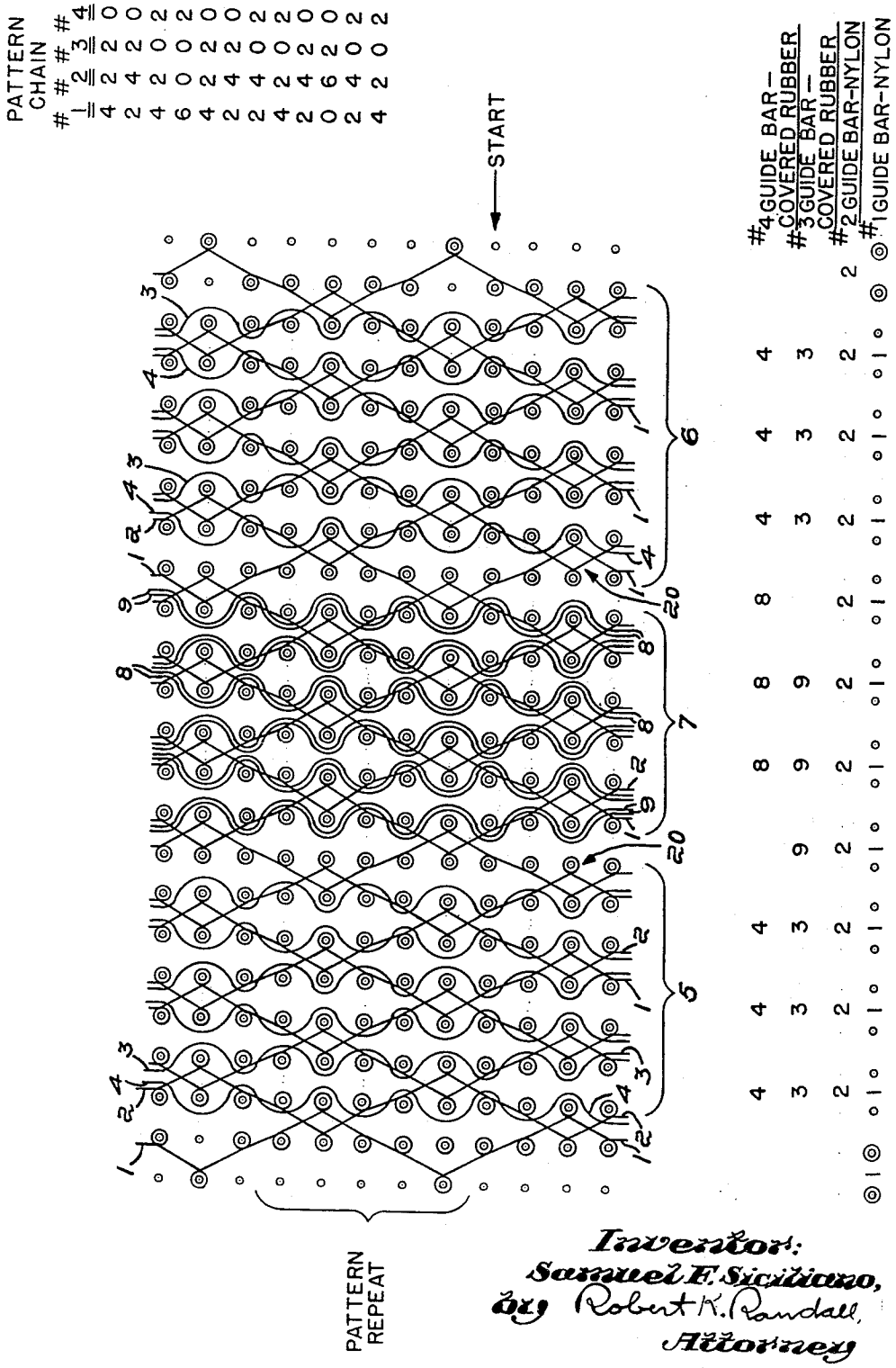
Nov. 22, 1960 S. F. SICILIANO 2,960,855

ELASTIC FABRIC

Filed Aug. 8, 1958



Inventor:
Samuel F. Siciliano,
by Robert K. Randall,
Attorney

United States Patent Office 2,960,8
Patented Nov. 22, 1

2,960,855

ELASTIC FABRIC

Samuel F. Siciliano, Westerly, R.I., assignor to George C. Moore Company, Westerly, R.I., a corporation of Rhode Island

Filed Aug. 8, 1958, Ser. No. 753,990

8 Claims. (Cl. 66—192)

This invention relates to flat elastic fabric of warp knit type commercially known as power net and widely used for the manufacture of girdles, corsets, and other supporting and body-molding garments. The elasticity and corresponding contractive effort of these fabrics is conferred through the inclusion of rubber strands inserted in stretched relation during their manufacture. The fabric is of two-way stretch character, capable of stretching simultaneously lengthwise and crosswise, as well as in all intermediate directions.

In making these garments it is often desired to have greater restraining or confining action at certain localities on the wearer's body, as at the abdomen and seat. When flat fabric is used, it has always been necessary to make these portions which exert extra restraint out of separate pieces of fabric, either of non-elastic fabric or else of elastic fabric of more powerful contractive effort, so far as I am aware. In many instances it would be desirable to make it out of integral elastic fabric having a greater contractive strength and hence greater resistance to stretching, so as to have greater restraining power, at the localities where such restraint is especially needed, and having a lesser contractive effort and hence greater flexibility and comfort for the wearer, at other locations within the width or length of a single integral piece of fabric.

The trouble has been that when the amount of rubber has been increased in one locality of a knitted elastic fabric, to give such portion of the fabric increased contractive power and hence greater restraining power, the unequal contractive power in different portions of the fabric caused the fabric to pucker, curl, and buckle, making it too difficult to work in putting together the garment and making an unsightly and unacceptable piece of apparel. Hence such unequal insertion of rubber cords has been strictly avoided.

I have found that the difficulty has been, not that the additional rubbers contract the fabric excessively at their location, but contrariwise that the additional bulk of rubber at these places restricts the contraction in the areas of their increased density, causing fullness and bulging in these areas. It is not possible to increase the size of the stitch just in these areas in a warp knitting machine without the use of extra guide bars which would greatly reduce production, and hence the confining effect of the stitches containing additional rubber inhibits the equivalent contraction of the zones where these rubbers are included, through preventing the lateral expansion of the rubber cords necessary for their lengthwise contraction. This cramping effect is likewise caused or added to by the windings of yarn with which the individual rubber cords are covered, and which would normally be wound in the same manner as the rubber cords comprising the rest of the fabric.

Recognizing the source of the trouble, I have found several ways in which such fabrics having different amounts of rubber at different locations can be made so as to lie flat. One solution is to apply the non-elastic

fibrous covering conventionally used on the rubber ments of the heavier portions with from 15% to fewer turns per inch than in the covering of the rul of the weaker portions of the same fabrics. Thus knitted into the fabric in properly stretched relation, will be more or less relieved of the restraint on thickening and hence on their shortening by the ings, and will have only the confining action of stitches to contend with. Accordingly, they will be to contract to the same extent and at the same ra the rubbers in the weaker portions of the fabric, so the material will lie flat in spite of the increased r ance to contraction in the stronger areas caused b greater bulk of rubber within the same size of s

Alternatively, a flat fabric can be obtained by a smaller size of fibrous warps to knit the rubber gether in the areas where the rubber elements are dou or otherwise increased in size or number to get incre contractive effort, than the size of the fibrous v forming the stitches around the single rubbers. with the same length of stitch the lesser bulk of the fil warps knitting the extra rubbers together does not vent contraction of these warps at the same rate a the same extent as the single or fewer rubber war the weaker parts. A variant of this second resort use lighter fibrous yarns in covering the rubbers i stronger areas, or both means may be used toge Also, the doubled rubbers can be inserted under gr tension, but this complicates the running of the mac it is more difficult to get a flat fabric.

In brief, the principle is that of giving the rul present in greater numbers or bulk in the stronger the same opportunity to contract lengthwise by h more freedom to expand widthwise—become thick than is given the rubbers in the weaker areas, by mo ing the relative radial confining pressure of the yar the encircling stitches or windings or both, exerte the rubbers.

Other objects of the invention and the manner of attainment are as set forth hereinafter.

The drawing shows a warp knit fabric with non-e knitted fibrous or filament warp yarns 1 and 2 and la single covered rubber warps 3 and 4 combined as sl in the diagram to form the areas or zones 5, 6, of l contractive effort, extending lengthwise of the fabric. warps 1 are knitted identically but symmetrically respect to warps 2, each being chained for two sti or courses, in one wale, and then shogged alternate right and left to the next wale. The laid-in rubber 3, 4, are covered in stretched relation in convent manner, preferably by a plurality of strands of fil yarn wound in one direction about the bare rubber with one or more strands wound reversely over the winding, both windings being applied conventional a low pitch.

Between the sections or longitudinally extending 5 and 6 of normal or lesser contractive effort is fo a longitudinal zone 7 in which the rubber elemen indicated at 8, 8 and 9, 9 are doubled to increase rially the contractive effort of the fabric in all direc of its extent.

In accordance with the principle of the invention rubber cores of these paired rubber elements 8 and respectively double-wrapped as described with fil or filament yarns of materially fewer turns per inc their length, as stretched in the covering machine, are applied to the rubbers 3 and 4. Thus if perm to relax fully they shrink to a substantially shorter l than the rubbers 3 and 4, after removal of both from the covering machine and its beams or spool

Both the single rubbers 3, 4 and the double ru 8, 9 are laid in under tension and are bound tight

face and back of the fabric by stitches of the non-elastic yarns 1 and 2 of identical type and size in all the zones 5, 6, 7 across the width of the fabric. Hence the confinement in zone 7 of the two strands 8, 8 or 9, 9 in a single stitch (at each course) of a size holding only the single rubber end in zones 5 and 6, prevents the lateral swelling of the two strands 8, 8, or 9, 9 within the stitch (which is a necessary concomitant of lengthwise contraction of these rubbers), to an extent which limits the contraction of the doubled rubbers to that commensurate with the single rubbers.

In other words, the increased radial confining action of the knitted yarns 1 and 2 which results from crowding two rubbers 8 and 9 into the same size stitch as is occupied by a single rubber 3 or 4, is compensated for by easing up on the radial confining action of the wrappings of the rubbers in the stronger section 7. With proper choice of the turns per inch of covering yarns on the rubbers in section 7, this zone will contract to the same extent and at the same rate as the zones 5 and 7, and the fabric will lie flat and smooth throughout its whole extent when in unstressed condition. The added squeezing of the doubled rubbers by the tightened stitches which oppose contraction of these rubbers to the same extent as the single rubbers do, is offset by easing up on the squeeze exerted by the covering yarns with which the doubled rubbers are wrapped.

Obviously, this principle can be applied conversely, by covering the single rubbers in the sections 5, 6, of basic fabric so as to reduce their contraction to match that of the double rubbers. But this has the drawback of shortening the stretch of the fabric all over, and is less practicable for general use, as it would make the garments harder to get into.

It is of course contemplated to get the increased contractive effort in certain zones of an integral fabric by inserting single rubbers of larger diameter than those in the weaker portions 5, 6, and hence of greater contractive effort, balancing the confining, contraction-reducing effect of the tightened stitches by lessened turns of covering yarns per inch. This construction is used where the stronger zones are desired to be less conspicuous and barely discernible.

The doubled rubbers of the example illustrated herein make the stronger zones stand out in contrast to the other portions, even when such rubbers are of the same diameter as the single rubbers. Hence if it is desired to call attention to the different zones in this latter style of net, the rubber warp is omitted from one or more wales 20 of the fabric at the meeting line between the strong and weak zones. These rubber-free wales have the appearance of hemstitching, and add materially to the attractiveness of the garment, especially when the fabric is used in oblique and symmetrically disposed (reversed) panels at front and rear. Also, these wales serve for ventilation, as their mesh opens widely under tension.

The construction of fabric shown in the drawing is merely illustrative, and the invention is in no way limited to this particular type of knit. The material is conveniently made on a Raschel type of warp loom, so that at least four guide bars will be available for use. In the drawing, beneath the point paper diagram of the pattern, which gives the relative lateral positions of the guide bars at any given point in the lapping movements, is given the order of threading of the four guide bars. Only one needle bed is required. The lapping movements of each guide bar during one repeat of the pattern are indicated in the details of the pattern chain given at the right-hand side of the diagram of the pattern, the bars 1, 2, 3, 4 of course referring to the guide bar associated with each chain, the guide bars being counted from the front of the machine. The starting point of the pattern repeat is indicated by the arrow and legend at the right-hand margin of the diagram of the pattern. The gauge of the machine, types and counts of yarn, and run-in per rack of the non-elastic yarns of warp, the quality of the fabric in courses per inch, and any special knitting features will be varied and determined in routine manner in the light of the nature of the goods desired.

A leading advantage of the novel fabric is that it can be produced at almost the same cost as plain power net having the usual uniform contractive effort throughout its area. The only material additional cost is for the added amounts of rubber and fibrous warps. The rate of production is the same as this conventional power net with uniform tension all over, such as the ground areas 5 and 6, because only the same number, four, guide bars are needed. By contrast, to depart from this ordinary ground to make fancy stripes having an appearance like the novel zoned fabrics, by customary methods would require a warp loop provided with six or seven guide bars, which would cut down the rate of production to one half, which would price the fabric out of the market.

An additional use of the invention fabric is to employ the stripes or zones of greater contractive effort as edge finish for the top and bottom edges of the girdle or other garment made from the fabric. In this connection, it is noted that the Raschel type machine admits of the knitting of six or more webs of fabric, each as wide as the height of the desired garment, simultaneously side by side in entirely separate relation from each other.

While I have illustrated and described a certain form in which the invention may be embodied, I am aware that many modifications may be made therein by any person skilled in the art, without departing from the scope of the invention as expresed in the claims. Therefore, I do not wish to be limited to the particular form shown, or to the details of construction thereof, but

What I do claim is:

1. Flat knitted elastic fabric having in combination laid-in elastic warps and knitted non-elastic yarns binding all the elastic warps together, these warps opposing greater resistance to stretching of the fabric in certain longitudinal zones than in other such zones, and all warps contracting to the same length when the fabric is in unstressed condition.

2. Fabric according to claim 1 in which the elastic warps in the respective zones are given equal freedom to contract lengthwise, by having unequal radial confining pressure of the yarns around them.

3. Flat knit two-way stretch elastic fabric comprising non-elastic knitted yarns and yarn-covered rubber warps laid in, the rubber warps being doubled in the stitches of certain wales and being single in other wales, the doubled rubbers in contracting being given more freedom to expand widthwise than is given the single rubbers.

4. Fabric according to claim 3 in which the doubled rubbers are subjected to less radial confining pressure by the yarns around them, than are the single rubbers.

5. Flat knit two-way stretch elastic fabric having in combination non-elastic knitted yarns and yarn-covered rubber warps laid in, certain zones of the fabric having greater resistance to stretching than other zones because of a greater amount of rubber therein, the warps providing this greater amount of rubber being wrapped with fewer turns of covering yarn per inch than the rubbers in the zones of lesser resistance to stretching.

6. Flat knit two-way stretch elastic fabric having in combination non-elastic knitted yarns and yarn-covered rubber warps laid in, certain zones of the fabric having greater resistance to stretching than other zones because of a greater amount of rubber therein, the non-elastic knitted yarns which surround the warps providing this greater amount of rubber being of smaller size than those around the rubbers of the zones of lesser resistance to stretching.

7. Flat knit two-way stretch elastic fabric having in combination non-elastic knitted yarns and yarn-covered rubber warps laid in, certain zones of the fabric having

greater resistance to stretching than other zones because of a greater amount of rubber therein, the yarns covering the warps providing this greater amount of rubber being of smaller size than those covering the rubbers in the zones of lesser resistance to stretching.

8. Flat knitted elastic fabric having in combination non-elastic warp yarns chained for a plurality of stitches in one wale and then shogged alternately to right and left to another wale, and yarn-wrapped rubber cords laid in each wale within the stitches thereof, the rubber cords having greater resistance to stretching in one zone of the fabric than in another and being allowed more freedom to expand widthwise within the yarns that encircle them.

References Cited in the file of this patent

UNITED STATES PATENTS

817,019	Sykes	Apr. 3, 1906
1,649,633	Wiese	Nov. 15, 1927
1,715,482	Vorck	June 4, 1929
1,797,693	Neidel	Mar. 24, 1931
1,853,666	Crimmins	Apr. 12, 1932
1,864,345	Fox	June 21, 1932
1,932,151	Welffens	Oct. 24, 1933
2,092,287	Moore	Sept. 7, 1937
2,411,175	Wagler	Nov. 19, 1946