

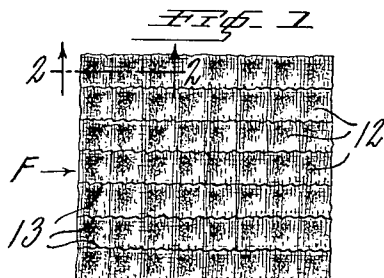
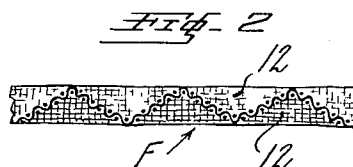
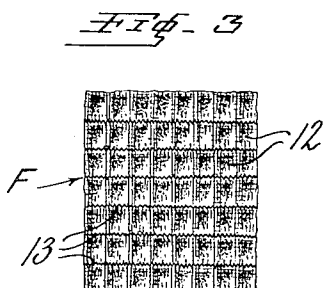
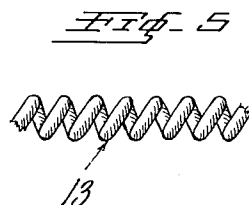
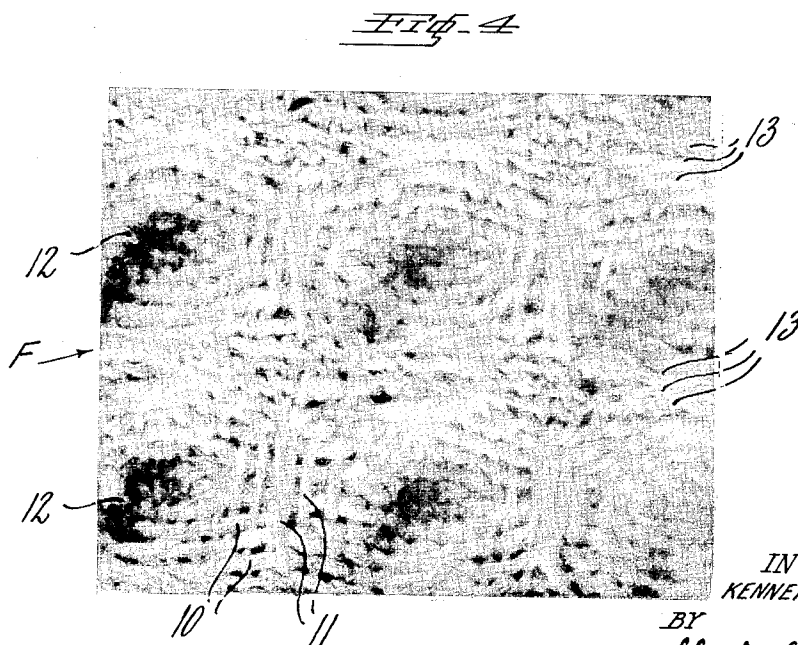
Jan. 31, 1950

K. W. KERR

2,495,847

HONEYCOMB ELASTIC FABRIC

Filed Jan. 18, 1949



INVENTOR
KENNETH W. KERR

BY
Charles C. Willson
ATTORNEY

UNITED STATES PATENT OFFICE

2,495,847

HONEYCOMB ELASTIC FABRIC

Kenneth W. Kerr, Dayton, Ohio, assignor to
United States Rubber Company, New York,
N. Y., a corporation of New Jersey

Application January 18, 1949, Serial No. 71,429

3 Claims. (Cl. 139-421)

1

This invention relates to a woven honeycomb fabric having longitudinal and transverse rows of cells or pockets, and more particularly to such a fabric having good elastic properties.

It is old to produce honeycomb fabrics formed by floating warp and weft yarns to different degrees and in a manner to produce pronounced cells or pockets at both faces of the fabric, and it has been proposed heretofore to increase the depth of these cells by shrinking the honeycomb fabric after it is woven.

The present invention contemplates an improved honeycomb fabric which while formed entirely of textile yarns, is made elastic either longitudinally, or transversely, or both longitudinally and transversely, so that the relaxed fabric is contracted to thereby increase its softness and the depth of its cells. Such a fabric may be woven of cotton, wool, rayon or other yarns as desired, and the same type of yarn may be used in both the warp and weft, or one type of yarn may be used in the warp and a different type in the weft as desired.

A good practical construction is an all-textile elastic fabric having a honeycomb weave produced by rows of cells with ridges between them and formed throughout of cotton yarn. Such a fabric has good heat insulating properties since the cells at both faces of the fabric provide numerous air pockets, and the contracted condition of this fabric increases the depth of these pockets and makes the fabric soft and warm for cold weather clothing. Also the elastic properties permit the fabric to stretch with movements of the body. Thus, the warmth of a woolen fabric is achieved without losing the good laundering properties of cotton or its comfort for wear next to the skin. The comfort is also enhanced by the honeycomb structure which allows a minimum contact with the skin for a given area of the fabric.

The all-textile elastic honeycomb fabric of the present invention is formed primarily of non-elastic yarns but has interwoven along the ridges elastic textile yarns that are highly twisted and coiled so that they are sufficiently elastic to contract or condense the fabric. If a one-way-stretch honeycomb fabric is desired these elastic yarns will extend either warpwise or weftwise, but if a two-way stretch fabric is desired the elastic yarns will extend both warpwise and weftwise.

The honeycomb weave is produced by varying the degree to which the warp and weft yarns are floated as they are arranged outwardly from

2

the center of a cell. Near the bottom of each cell the warp and weft yarns are interwoven at frequent intervals, and the floating of the warp and weft yarns is increased outwardly towards the outer edges of the pockets. This produces a fabric having upon each face aligned squares, with the centers of the squares depressed, and ridges defining the edges of the squares. The point of intersection of two ridges upon one face of the fabric coincides with the apex at the bottom of a pocket at the other face of the fabric.

The desired elastic properties are imparted to the fabric by providing, interwoven along the ridges that extend in the direction in which the fabric is to stretch, a few all-textile elastic yarns, that have been made elastic by giving them a high twist and numerous coils in the direction in which they are twisted, as fully disclosed and claimed in the Foster Patent No. 2,387,320.

After the honeycomb fabric contemplated by the present invention comes off the loom it is contracted by wetting it in warm or hot water to contact the elastic yarns so that they will contract the fabric. The fabric is then dried while free of tension. The contracted coiled yarns will hold the fabric yielding in the contracted condition so that it will stretch and retract a substantial amount, and the contraction of the fabric will buckle or pucker it to increase the depth of the cells.

The present honeycomb elastic fabric is, as above stated, well adapted for use as warm under-clothing to be worn in cold climates. It is also well adapted for use as a lining material for warm wearing apparel, wherein it may be covered at each face with a stronger wear-resistant fabric. This honeycomb fabric may also be used in other fields where its soft cushion-like properties together with its stretch and insulating properties are desired.

The above and other features of the present invention will be further understood from the following description when read in connection with the accompanying drawing, wherein;

Fig. 1 is a face view of the honeycomb fabric of the present invention, as it comes off the loom and before it has been shrunken.

Fig. 2 is an enlarged sectional view taken on the line 2-2 of Fig. 1.

Fig. 3 is a view similar to Fig. 1 showing the fabric after it has been shrunken and rendered elastic.

Fig. 4 on a larger scale is a photographic view of a portion of the fabric of Fig. 1 but shown as

3

stretched warpwise slightly more than in Fig. 1; and

Fig. 5 is a side view of a twisted and coiled elastic textile yarn used in the fabric of the present invention to make it elastic.

Since the honeycomb elastic fabric of the present invention may, as above stated, be formed entirely of cotton, it will now be described in connection with the drawing as formed throughout of cotton yarns.

The fabric F shown in Figs. 1 to 4 inclusive is formed primarily of cotton warp yarns 10 and cotton weft yarns 11, of usual construction and having an ordinary amount of twist. These yarns 10 and 11 are interwoven to form the cells or pockets 12 disposed at both sides of the fabric. The cells 12 are produced by so weaving the fabric that the warp and weft yarns are closely interwoven at the bottom of the cells but are floated to an increasing degree in an outward direction to the four edges of the pockets, as will be apparent from Fig. 4 which shows the yarns floated to a substantial degree at the edge of the pockets where they form longitudinal and transverse ridges. The floating of the yarns depresses the closely woven bottoms of the cells and brings the edges of the cells to the surface. This type of weave produces a construction in which the bottoms of the cells, as viewed from one face of the fabrics help form the rims of the cells at the opposite face of the fabric.

While the fabric is formed largely of the warp yarns 10 and weft yarns 11, the desired stretch is imparted thereto by introducing in the fabric, in the direction it is to be extensible, the highly twisted and coiled yarn 13 shown in Fig. 5. These yarns 13 are preferably constructed as disclosed in the Foster Patent 2,387,320, and can be seen in Fig. 4 where they appear on one face of the fabric as floating warp ribs disposed between the cell rows and have extending at right angles thereto the floated weft yarns 11 disposed between the cells, so that the floating elastic warps 13 produce longitudinally extending ridges and the floating wefts 11 produce transverse extending ridges. These ridges form the square or rectangular outline for the cells.

The fabric shown in Fig. 1 and on a large scale in Fig. 4 is slightly shrunken, since it contracts slightly both longitudinally and transversely as it comes off the loom. This fabric of Fig. 1 is shown in Fig. 3 as having been shrunk warpwise about 33% and weft-wise about 10%, by wetting the fabric in warm or hot water and drying it free from tension. This permits the elastic yarns 13 to contract in the form of helical coils and thereby contract the fabric to increase the depth of the cells.

The coiled yarns 13 are exposed more at one face of the fabric than at the other. Therefore where the fabric is to be worn next to the body it is desirable to place the coiled yarns, which are not as soft as the other yarns, away from the body. The feel of the fabric against the body may be made softer by sanding this face slightly.

Should the fabric of the present invention be held for a long time under tension it will lose its elastic property, but the elasticity of the fabric can be restored by again wetting it in hot water and drying the fabric free of tension. The sectional view of Fig. 2 shows how the cells or pockets 12 visible at one face of the fabric lie between the cells or pockets visible at the opposite face of the fabric.

4

In order that a further understanding of the fabric of the present invention may be had the following table is given and shows the properties of the off the loom fabric of Fig. 1 and the properties of this same fabric after it is shrunken as shown in Fig. 3.

TABLE

All cotton stretchable honeycomb fabric

		Off The Loom	After Shrink-ing
1	Width inches.....	21.8	19.1
2	Weight ozs. per sq. yd.....	7.2	13.2
3	Warps per inch.....	56.5	65.0
4	Wefts per inch.....	54.5	90.0
5	Elastic warps per inch.....	12.0	14.5
6	Nonelastic warps per inch.....	44.5	50.5
7	Gauge at 3.4 p. s. i..... inches.....	.026	.055
8	Elastic warp construction.....	12/s/1	-----
9	Non-elastic warp construction.....	20/2	-----
10	Weft construction.....	20/1	-----
11	Percent Wt. elastic yarn in warp.....	19.5	-----
12	Percent Wt. non-elastic yarn in warp.....	48.7	-----
13	Percent Wt. of weft.....	31.8	-----
14	Warp stretch at break..... percent.....	34.1	-----
15	Weft stretch at break..... do.....	17.3	-----
16	Air permeability ¹	-----	248
17	Porosity—percent of air space in fabric.....	-----	92.9
18	Therm. cond. (calc) ²	-----	0.86
19	Gauge at 1 p. s. i..... inches.....	-----	0.166
20	Compressibility..... percent.....	-----	38.8
21	Resiliency..... do.....	-----	58.2
22	Decrease in length of fabric due to shrink-age..... percent.....	-----	44.0
23	Longitudinal pockets per inch (about).....	-----	5.00

¹ Cubic feet per square foot per minute at ¼ inch of water pressure.

² Therm. Cond. = $\frac{1}{(0.15)(C)(W) + 0.63} - B$. T. U./sq. ft./min./deg. F.

where C is compressibility in percent and W is weight in lbs. per sq. ft.

The compressibility and resiliency given in the table are found as follows. A sample of the fabric is placed under load, the load increasing in fractions of a pound in this sequence: 0.1, 0.2, 0.35, 0.5, 0.75, 1.0, 1.5 and 2.0 lbs./sq. in. Thickness of the sample is read at each loading. The load is then removed in the reverse sequence until the sample is under a pressure of 0.1 lb./sq. inch. Compressibility is taken to be

$$\frac{A-B}{A} \times 100$$

where A is the original thickness at the 0.1 lb. load and B is the thickness at the 2.0 lb. load. Resiliency is

$$\frac{C-B}{A-B} \times 100$$

where A and B are as expressed above and C is the thickness at the final load of 0.1 lb./sq. in. after removing the load to that point.

When the all cotton elastic fabric illustrated in Fig. 3 of the drawing is made up into an under garment to be worn next to the skin it will be found soft and comfortable and its easy stretch will improve its fit as a garment and allow it to stretch with the body movements, and the numerous air cells at both faces of the fabric will give it high heat insulating properties.

While the fabric herein shown and described with reference numerals is a one way stretch fabric constructed to stretch in the direction of the warp, it will be apparent that it could be produced to stretch in the direction of the weft, or in the direction of both the warp and weft to provide a two way stretch fabric, and that while it has been described as formed entirely of cotton yarns, it may, as above stated, be formed of various other textile yarns to vary the properties of the finished product.

5

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. An elastic fabric having a honeycomb weave, said fabric being formed of warp and weft yarns interwoven and floated to different degrees to produce longitudinal and transverse rows of cells with ridges between them, and having interwoven therewith along the ridges that extend in one direction highly twisted and coiled textile yarns possessing good elastic properties and adapted yielding to contract the fabric and thereby increase the depth of the cells and render the fabric elastic.

2. An all-textile elastic fabric having a honeycomb weave, said fabric being formed of non-elastic warp and weft yarns interwoven and floated to different degrees to produce longitudinal and transverse rows of cells with ridges between them at both faces of the fabric, and having interwoven therewith along the ridges that

6

extend in one direction highly twisted and coiled yarns possessing good elastic properties and adapted to contract the fabric and thereby increase the depth of the cells.

3. An elastic fabric having a honeycomb weave, said fabric being formed of warp and weft yarns interwoven and floated to different degrees to produce longitudinal and transverse rows of cells with ridges between them at both faces of the fabric, and having interwoven therewith along the ridges that extend in one direction highly twisted and coiled textile yarns possessing good elastic properties and adapted yielding to contract the fabric and thereby increase the depth of the cells and give the fabric an elastic extensibility of over 25%.

KENNETH W. KERR.

No references cited.