Jan. 23, 1940. R. GROSSER 2,188,183

ELASTIC WOOLEN FABRIC

Filed May 26, 1937

FIG. 1

FACE VIEW OF CLOTH

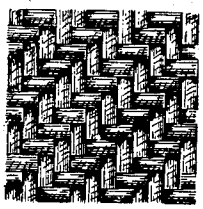


FIG. 2

BACK VIEW OF CLOTH

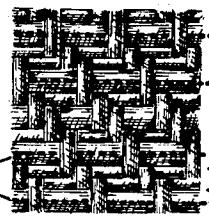


FIG 3

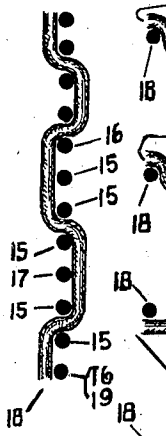


FIG. 4



FIG. 5

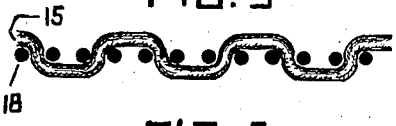


FIG. 6



FIG. 7

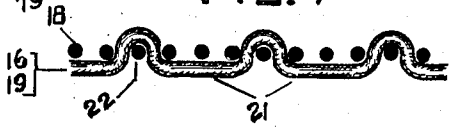
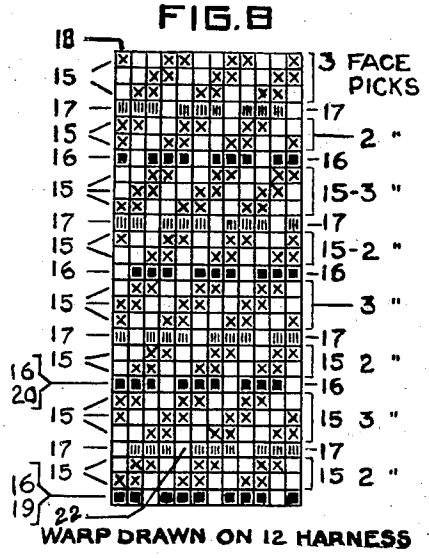


FIG. 8



WARP DRAWN ON 12 HARNESS

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UNITED STATES PATENT OFFICE

2,188,183

ELASTIC WOOLEN FABRIC

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Application May 26, 1937, Serial No. 144,913

4 Claims. (Cl. 139—421)

This invention relates to a new and improved woven fabric adapted for outer wear formed of woolen-worsted yarn and strands of an elastic yarn of which latex forms a core. The strands containing the latex core are preferably formed in the manner described in the patent to Adamson No. 1,822,847, patented December 18, 1931. This patent discloses an elastic yarn having a core of vulcanized rubber or latex composition held under tension by left and right helical windings of yarn which form a cover for the core and hold the latter in a permanent elongated or stretched condition. It will be obvious, however, from the following that elastic yarns other than those of the Adamson patent may be employed in the fabric of the present invention.

More particularly my invention contemplates the structure of a weave composed of strands of woolen-worsted and elastic rubber yarn wherein the latter yarn is distributed in predetermined relation with the woolen-worsted yarn weft wise of the fabric in such a way as to bring out the elasticity of the fabric without disturbing the smoothness of the twill of the face of the fabric so that it will appear as a cassimere fabric on its face.

In other words, the problem solved by me is to so correlate the stretch of the elastic yarn with the woolen-worsted yarn in the weaving operation that when the woven fabric is in its normal unstretched condition, there will be no tendency of the elastic yarn to produce a crinkling of the fabric or disturb its smooth diagonal.

The prime object of my invention, therefore, is to provide a new and improved woven woolen-worsted fabric adapted for outer wear having a smooth faced surface and having elastic threads incorporated with the weft threads during the course of the weaving operation whereby the finished fabric, while inelastic in a warp wise direction, has a stretch or elasticity in a weft wise direction.

Another object of my invention is to so weave a woolen-worsted fabric adapted for outer wear that when the woolen-worsted strands of the fabric have been set in the finishing of the fabric subsequent to the weaving thereof, the shrinking of the fabric, due to said finishing operation, will render said fabric smooth on both sides and the fabric will have the appearance of a cassimere or worsted faced fabric with the added quality of stretchability in a weft wise direction.

Other objects and features of the invention will more fully appear upon reference to the accompanying drawing, in which:

Fig. 1 is a plan view of the front face of a piece of my improved fabric.

Fig. 2 is a plan view of the back of the piece of fabric shown in Fig. 1; the dotted lines indicating certain face picks, and showing the manner in which the picks of the back systems are covered and rendered invisible at the face of the fabric by the picks so indicated in dotted lines.

Fig. 3 is a view in cross section showing the interlacing of the first, left hand, warp thread of Fig. 8 with a number of the picks of the weft threads.

Fig. 4 is a view in cross section showing the interlacing of the fourth weft thread from the bottom of Fig. 8 with a number of the warp threads.

Fig. 5 is a view similar to Fig. 4, showing the interlacings of the third pick from the bottom of Fig. 8.

Fig. 6 is a view similar to Fig. 4 showing the interlacings of the second pick from the bottom of Fig. 8.

Fig. 7 is a view similar to Fig. 4, showing the interlacings of the first, or bottom, pick of Fig. 8,

Fig. 8 is a twelve-harness weaving diagram of the fabric, in which the inelastic face picks, the inelastic back picks, and the elastic back picks are symbolically distinguished and enumerated.

The orders of filling and weaving by which the fabric is given its elasticity and by reason of which the twill may be made to be and remain smooth and undisturbed throughout, and after all proper finishing operations, despite the presence in the fabric of back systems which contract both on leaving the loom and in the finishing operations, and despite all pulls incidental to the contraction of rubber threads, will now be described; it being understood that the elastic threads are under tension while being woven, and that the loom reed width, as hereinafter more particularly specified, is accordingly greater than that at which ordinary non-elastic fabrics of the same ultimate or finished width are woven.

Fig. 8 is the diagram for one complete repeat of the weaving order, the number of picks or filling threads therein being 28. Of these 28 picks, there are 20 face picks or filling threads 15, preferably of 2/36 worsted; 4 inelastic back picks 16, preferably of the same worsted; and 4 elastic back picks 17. In Figs. 3 and 8, a warp thread 18 is designated as the first or starting warp thread; and, in Figs. 7 and 8, a thread 19, which is one of the threads 16 of the inelastic back system, is designated as the first or start-

ing pick. It will be understood, however, that provided the proper filling and weaving orders are followed, it is of no consequence which threads are elected to be shown and described as the starting points of the weave.

The filling order of the picks of the above mentioned three sub-systems is indicated by the bracketing shown at the right hand side of Fig. 8. Reference to this will show that the face picks are laid in alternated groupings of 2 and 3, between the inelastic and elastic picks of the two back systems. In Fig. 8, a pick 16 of the inelastic back system is shown as the first pick. Then follows a group of 2 face picks. A pick 17 of the elastic back system follows this group of face picks, to be followed in turn by a group of 3 face picks. Another pick 16 of the inelastic back system is then laid; and the same alternation continued.

In this specification and in the claims hereof, it will be sufficient to describe the combined filling and weaving orders as the same affect any four successive warp threads, or for a 4 harness weave. Elaboration thereof for the 12 harness weave of Fig. 8, or for any multiple of four will be understood by any one skilled in the art, and is in fact shown in Fig. 8. In the following description, therefore, the filling and weaving orders are described as for the four left-hand warps of Fig. 8. These orders are as follows:

A pick 19 of the inelastic back picks 16 is laid 2 up—1 down—1 up: then follows an inelastic face pick 15, 2 up—2 down: then follows another inelastic face pick 15, 1 down—2 up—1 down: then follows one of the elastic picks 17 of the elastic back system, 1 down—3 up: then follows another inelastic face pick 15, 2 down—2 up: then follows another inelastic face pick 15, 1 up—2 down—1 up: and then another inelastic face pick 15, 2 up—2 down. After these seven picks have been woven, they are followed by seven more picks in the filling order of 1 inelastic back pick; 2 inelastic face picks; 1 elastic back pick; and 3 inelastic face picks, as shown in Fig. 8; (see the bracketing in that figure).

This second order of seven picks, however, does not repeat the weaving order of the first seven; for, as will be seen upon reference to Fig. 8, the inelastic back pick 20 thereof, instead of being woven 2 up—1 down—1 up, as in the first seven, is woven 3 up—1 down, and there is a corresponding rightward shift of the points of interlacement of the other picks of the second order of seven with the warp threads. Only after four of such orders of seven picks have been woven, and the fifth of such orders is reached, does there appear a filling order of seven picks in which the weaving order duplicates that of the first seven picks, above described. The complete repeat is therefore 28.

Throughout this repeat of 28, there is, viewed from one pick to the next succeeding pick, of the same system, a progressive, one-warp, weftwise shift of corresponding points of interlacement of warp and weft. In the drawing this shift is shown as a rightward shift, to accord to the ordinary rightward incline of twill lines, but if desired the weftwise shift could be leftward within the scope of the invention, in which event the twill lines would incline leftward.

It has been stated that the elastic threads are tensioned when being woven, and that consequently the loom reed width at which the fabric is woven is considerably greater than would be required for the weaving of an ordinary non-elastic fabric of the same desired finished width. For instance, for the weaving, according to the present invention, of a suiting of standard 54" to 56" finished width, a good loom reed width would be 76" to 80". However, according to the degree of elasticity desired in the finished fabric, and for other considerations, the percent, degree or amount by which the loom reed width is to exceed the desired finished width of the fabric may vary within wide limits. It will be understood that to the degree the width of the loom exceeds the width of the finished fabric, the number of warp ends per unit of reed width may be decreased, without, however, affecting the total number of warp ends.

It will also be understood that the increase in loom reed width involved in making my elastic fabric involves corresponding increase in length of the inelastic picks; and that as these contract with the elastic threads, they assume a degree of crimp not ordinarily found in inelastic fabrics. After the finishing operations, this crimp does not impair the appearance of the fabric, and it allows for the elastic stretch of the fabric under conditions of wear.

The elastic and inelastic back picks, at all points where they overlie and depress the warp threads, are themselves overlaid by adjacent face picks, so that the result is a smooth face weave in which no back picks are anywhere visible. Proper realization of this feature of the invention depends to some extent upon the employment of proper finishing operations, hereinafter more specifically to be recited. It is the novel weave itself, however, which makes possible the success of such finishing steps. It will be noted from Fig. 2, (see the dotted lines thereof), that throughout the length of the back picks the same are overlaid by adjacent face picks; such adjacent face picks being in contact with each other, and each being shown by the dotted lines 34 as overlying one half of the submerged back pick.

All necessary or desirable finishing operations here involved are old and well known, and need not here be described in detail. However, as above indicated, the system of weaves and the weaving order of placing different kinds of yarns, inclastic wool picks and elastic rubber picks, requires a special treatment in the finishing, to set the texture, and to retain the permanent stretch, filling-wise, and at the same time give the fabric that smooth diagonal twill effect on the face, which is the important feature of this invention.

The raw cloth coming off the looms, for a 56" finished fabric, will measure about 72.5" wide. It should be carefully rolled on the drum or cylinder of a crabbing machine, and all the yarn threads in the fabric fixed or set. It should then be scoured to remove the oil or grease content in the material. During this last operation, the width will contract from three to four inches, giving additional stretch to the cloth. At the same time an adjustment takes place in the alignment and bending of the yarns in the weave; with the result that the back picks will find the proper positions with respect to the picks of the face weave, with a closing up of the points of interlacing into a continuous twill effect, in which, as hereinbefore stated, the elastic picks are rendered completely invisible at the face of the fabric.

In any further processing, such as light fulling or dyeing or steaming, a further contraction of the texture, filling-wise, will take place, and more

stretch thus obtained without disturbing the smooth face effect. Appreciable deviation from the above finishing operations is likely to develop defects, such as wrinkles, crepe effect, pockets or cockles.

I claim:

1. A wool-worsted, weft-wise elastically stretchable fabric, consisting of three systems of weaves, one system being a 2 up—2 down face twill, another being a 3 up—1 down elastic back weave, and the third being a 3 up—1 down inelastic back weave, said systems being combined into a composite system having filling and weaving orders as follows: an inelastic back pick 2 up—1 down—1 up, the next an inelastic face pick 2 up—2 down, the next an inelastic face pick 1 down—2 up—1 down, the next an elastic back pick 1 down—3 up, the next an inelastic face pick 2 down—2 up, the next an inelastic face pick 1 up—2 down—1 up, and the seventh an inelastice face pick 2 up—2 down; said succession, to wit, one inelastic back pick, then two inelastic face picks, then one elastic back pick, and then three inelastic face picks, being indefinitely continued in a development of said weaving orders, in which development corresponding points of weft and warp interlacings, in each of said three systems therein, have a progressive one-warp shift in a common weft-wise direction, viewed from one pick to the next succeeding pick of the same system, for a repeat of the composite system in every 28 picks.

2. A wool-worsted, weft-wise elastically stretchable suiting, consisting of three systems of weaves, one system being a 2 up—2 down face twill, another being a 3 up—1 down elastic back weave, and the third being a 3 up—1 down inelastic back weave, said systems being combined into a composite system having filling and weaving orders as follows: an inelastic back pick 2 up—1 down—1 up, the next an inelastic face pick 2 up—2 down, the next an inelastic face pick 1 down—2 up—1 down, the next an elastic back pick 1 down—3 up, the next an inelastic face pick 2 down—2 up, the next an inelastic face pick 1 up—2 down—1 up, and the seventh an inelastic face pick 2 up—2 down; said succession, to wit, one inelastic back pick, then two inelastic face picks, then one elastic back pick, and then three inelastic face picks, being indefinitely continued in a development of said weaving orders, in which development corresponding points of weft and warp interlacings, in each of said three systems therein, have a progressive one-warp shift in a common weft-wise direction, viewed from one pick to the next succeeding pick of the same system, for a repeat of the composite system in every 28 picks, and the elastic back picks, in the finished suiting, at the points where they interlace with the warp and overlie the same, being covered by adjacent face picks, whereby to be invisible at the face of the suiting.

3. A wool-worsted, weft-wise elastically stretchable fabric, consisting of three systems of weaves, one system being a 2 up—2 down face twill, another being a 3 up—1 down elastic back weave, and the third being a 3 up—1 down inelastic back weave, said systems being combined into a composite system having filling and weaving orders as follows: an inelastic back pick 2 up—1 down—1 up, the next an inelastic face pick 2 up—2 down, the next an inelastic face pick 1 down—2 up—1 down, the next an elastic back pick 1 down—3 up, the next an inelastic face pick 2 down—2 up, the next an inelastic face pick 1 up—2 down—1 up, and the seventh an inelastic face pick 2 up—2 down; said succession, to wit, one inelastic back pick, then two inelastic face picks, then one elastic back pick, and then three inelastic face picks, being indefinitely continued in a development of said weaving orders, in which development corresponding points of weft and warp interlacings, in each of said three systems therein, have a progressive one-warp shift in a common weft-wise direction, viewed from one pick to the next succeeding pick of the same system, for a repeat of the composite system in every 28 picks, and the points where the elastic back picks interlace with the warp and overlie the same being so distributed that in such a repeat no two of such points fall on the same warp end.

4. A weft-wise elastically stretchable fabric, consisting of three systems of weaves, one system being a 2 up—2 down face twill and the other two systems being 3 up—1 down back weaves, one at least of which back systems is composed of elastic threads, said systems being combined into a composite system having filling and weaving orders as follows: a back pick 2 up—1 down—1 up, the next a face pick 2 up—2 down, the next a face pick 1 down—2 up—1 down, the next a back pick 1 down—3 up, the next a face pick 2 down—2 up, the next a face pick 1 up—2 down—1 up, and the seventh a face pick 2 up—2 down; said succession, to wit, one back pick, then two face picks, then one back pick, and then three face picks, being indefinitely continued in a development of said weaving orders, in which development corresponding points of weft and warp interlacings, in each of said three systems therein, have a progressive one-warp shift in a common weft-wise direction, viewed from one pick to the next succeeding pick of the same system, for a repeat of the composite system in every 28 picks.

RICHARD GROSSER.