April 17, 1928. 1,666,638

E. J. BENNETT

WARP KNITTED FABRIC AND METHOD OF MAKING SAME

Filed Sept. 25, 1926

Fig. 1.

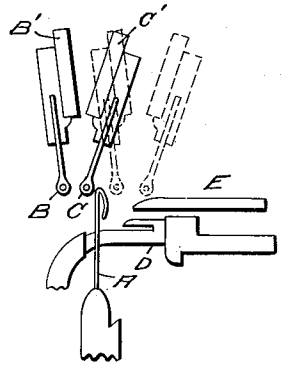

Fig. 2.

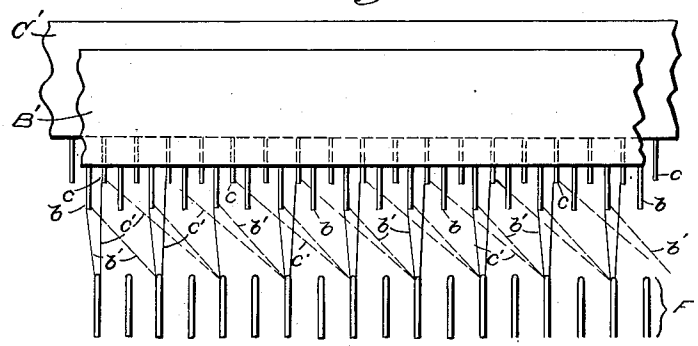

Fig. 3.

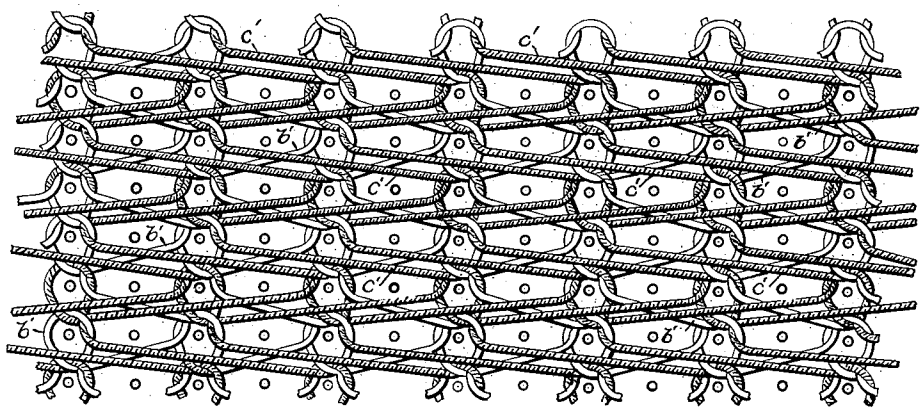

Fig. 5.

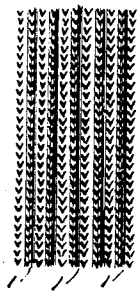

Fig. 4.

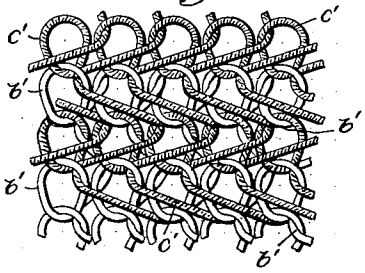

Fig. 6.

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UNITED STATES PATENT OFFICE.

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WARP-KNITTED FABRIC AND METHOD OF MAKING SAME.

Application filed September 25, 1926. Serial No. 137,728.

This invention relates to warp knitted fabrics and to the process or method of making the same.

In order that the principle of the invention may be readily understood, I have shown in the drawing and will describe a single embodiment of the fabric of my invention, and shall set forth the preferred or best mode known to me for carrying out the process or method of my invention.

In the accompanying drawing,—

Fig. 1 is a vertical sectional view of one of the needles, two yarn guides and other parts of a warp knitting machine upon which the fabric of my invention is preferably produced;

Fig. 2 is a diagrammatic view in elevation representing a group of needles and corresponding portions of two guide bars and the threads fed from guides of said bars in two consecutive courses;

Fig. 3 is a somewhat diagrammatic view showing in a distended form and much enlarged a warp fabric constructed in accordance with my invention;

Fig. 4 is a somewhat diagrammatic view of the fabric shown in Fig. 2 but in a normally contracted condition;

Fig. 5 is a view on a still smaller scale of the front face of the fabric; and

Fig. 6 is a similar view on the back face thereof.

An important purpose of my invention is to form a warp knitted fabric which is not only non-running and non-revelling but has great lateral elasticity.

While the fabric of my invention may be variously manufactured, I prefer to knit the same upon a flat warp knitting machine and preferably upon one employing two thread carrying guide bars each operated by an individual cam or cams. It is customary to form warp knitted fabrics upon a warp knitting machine having two independently operated thread carrying bars, and it is also customary in producing work upon such a machine to have the number of needles equal to the number of thread guides in each one of the two guide bars; in other words, it is common to employ in such a machine one half as many needles as there are threads supplied to the two guide bars, but not with the arrangement of threads or for the purpose of producing the fabric herein described.

In the practice of my invention I desirably employ two sets of so-called warp threads, one set being fed through the guides or guide eyes of one of the guide bars and the other set being fed through the guides or guide eyes of the other guide bar. I employ, however, as the total number of threads only the same number of threads as there are needles on the machine. I also in forming the disclosed embodiment of the fabric of my invention (which is chosen merely as one form of many that may be provided) introduce threads only through alternate guide eyes of each of the two guide bars; that is, in the present instance I introduce a thread through the first guide eye of the front guide bar, another thread through the third guide eye of that bar and another through the fifth guide eye, etc., and I introduce a thread through the first guide eye of the rear guide bar, another thread through the third guide eye of the rear guide bar, another thread through the fifth guide eye of the rear guide bar, etc. The two guide bars with the threads so introduced through the guide eyes thereof are independently moved and in the present instance so that in one course the threads of the front guide bar are introduced to the first needle, the third, the fifth, etc., and in the next course the same threads are laterally shifted or lapped, and are fed to the third needle, the fifth, the seventh, etc., thus skipping over or lapping past the second, the fourth and the sixth needles, in both courses. In the formation of the said first course, the threads of the rear guide bar are supplied or delivered to the first needle, the third needle, the fifth needle, etc., and in the next course the said threads are laterally shifted or lapped so as in each instance to skip or lap past three needles, the said thread of the first needle thus skipping over to the fifth needle, the thread of the third needle skipping over to the seventh needle, etc.

It will, of course, be understood that the fabric thus produced, while constituting a representative embodiment of my invention, is but a single embodiment of many that may be produced in accordance with the principle of my invention. In other embodiments thereof either thread may skip a needle or needles other than or more than those here illustrated and specifically described.

The result is to produce a fabric which is not formed of pillars or strand-like portions

spaced apart by openings of greater or less length, but the fabric is one devoid of substantial openings or spaces, inasmuch as each thread, although it may skip one or more needles, always passes about a needle so nearly adjacent the previous needle receiving that thread as to make the fabric of a generally uniform character, though having different portions thereof contrasted with each other, in that the two groups of threads extend or may extend relatively different distances from one needle to the next needle receiving that particular thread.

The result is to form a warp knitted fabric of very great elasticity. I attribute this elasticity largely to the fact that the threads have extended laps and particularly those threads here shown as skipping three consecutive needles, such threads after each lap being immediately returned upon themselves and then lapping as far in the opposite direction.

Referring more particularly to the drawings, I have in Fig. 1 represented at A a single needle of a warp knitting machine, and at B and C respectively have indicated one guide eye of the front guide bar B′ and one guide eye of the rear guide bar C′. One of the sinkers is represented at D and the presser bar at E.

In Fig. 2, I have represented in side elevation a portion of the front guide bar at B′ and a series of guide eyes *b*. At C′ I have represented in side elevation a portion of the rear guide bar and have represented at *c* the guide eyes carried thereby. It is, of course, to be understood that each of the guid eye bars is extended entirely across the machine and that preferably each of said bars has as many guide eyes as there are needles in the machine. The said guide bars are operated independently in any suitable manner, as, for example, by means of the general character disclosed in the patent to Weeper, No. 966,875, August 9, 1910.

At F, I have indicated a number of needles, eighteen being shown, which number corresponds with the number of guide eyes shown on the front guide eye bar B′ and also corresponds with the number of guide eyes shown on the rear guide bar C′.

I have in Fig. 2 illustrated the threads as delivered by the front guide bar and by the rear guide bar in two consecutive courses, and it will be understood that in the disclosed form or embodiment of my invention the said two courses are duplicated or repeated throughout the remainder of the fabric, considering the same both in its lateral extent and in its longitudinal extent.

It will be observed that the first, third, fifth, etc. guide eyes of the front guide bar B′ are threaded, and in the first course the said threads designated *b′* are fed to the first needle, the third needle, the fifth needle, etc., such threads being shown in solid lines. In the next course the same threads are fed instead to the third needle, the fifth needle, the seventh needle, etc., and are illustrated by dotted lines. Referring to the rear guide bar C′, it will be observed that threads are fed or introduced through the first guide eye, the third, the fifth, the seventh, etc., and in the said first course said threads, as indicated by the solid lines C′, are fed to the first needle, the third needle, the fifth needle, etc., and in the next course the same threads, as shown by the dotted lines, are fed to the fifth needle, the seventh, the ninth, etc., respectively. The result is to produce a fabric which is illustrated in detail in Fig. 3.

In said Fig. 3, several of the threads introduced through the front guide bar B′ are indicated at *b′* in lighter shading, and it will be noted that in each instance the said threads lap from a first needle to a third needle, always skipping the intermediate or second needle. It will also be noted that the threads introduced through the rear guide bar B′ are indicated at *c′* as introduced to a first needle and then to a fifth needle, and then back again to the said first needle, skipping or lapping past all the intermediate needles, said threads being indicated by the heavier shaded lines. The loops formed at those needles to which threads are at any time supplied are of the characteristic shape of warp knitted loops, and are shown upon an enlarged scale in Fig. 3. This figure shows the fabric laterally distended so as to make the path of each thread clear.

Those needles which are skipped in the lapping of the threads I term the non-working needles, and the loops which are formed upon the working needles are so connected with each other by the back and forth lapping of the threads that the loops permit a greater stretch than ordinary tricot knitting, and they cause the fabric to possess a much greater elasticity or tendency to return after stretching to the finished or normal position. Examination of the fabric produced in accordance with my invention discloses the fact that one face, which I term the front face, is provided with what I may term ribs or ridges indicated at 1 in Fig. 4, these so-called ribs extending longitudinally of the fabric, that is, lengthwise of the knitting, and giving the fabric an appearance upon that face very closely resembling ordinary rib knitting. The opposite face of the fabric, namely, the back face shown in Fig. 5 has the appearance of flat warp work. The fabric knitted in accordance with my invention is of substantially uniform texture throughout and is composed of two sets of threads, one set whereof is throughout the fabric lapped a short distance, and the other set is throughout the

fabric lapped a markedly greater distance, the length of the set of short laps being materially greater than the width of a knitted loop of the fabric measured transversely of said fabric, and the length of the other set of said laps being markedly greater than said short laps. The threads of the prolonged loop enhance the elasticity.

As an illustration of the great elasticity of the fabric constructed in accordance with my invention, I may state that in finishing ordinary tricot warp knit cloth made 144 inches in width, the finished cloth will measure about 84 inches in width, and that cloth when properly finished is dressed until there is no longitudinal elasticity. In finishing cloth produced in accordance with my invention, cloth made 144 inches in width will shrink when finished to 55 inches, but will stretch easily out to 100 inches in width and will return, when released, to 55 inches without any manipulation.

It will be understood that in a fabric constructed in accordance with my invention, both sets of threads are so lapped back and forth that the fabric is one devoid of holes or openings, but is nevertheless of a somewhat open structure due to the constant missing or skipping of certain needles by the threads as described. The lapped portions of the threads extending as they do from one needle loop to another needle loop, permit the fabric to be very considerably extended laterally, but immediately upon release of the fabric the needle loops, which have been contracted when the fabric is laterally distended, enlarge to their original size and draw upon the lapped or intervening portions of the threads so as to cause the fabric to return at once to its original width.

The two sets of threads may, of course, be of the same color or of contrasting colors, and with the contrasting colors it is obvious that many different designs may be provided, dependent upon the extent of lap of the two sets of threads.

It will also be understood that within the scope of my invention the extent of lap of either or both sets of threads may be varied during the formation of the fabric. In other words, it is not necessary that that set of threads here shown as lapping from a first needle to a third needle always have such lap throughout the entire fabric, as at parts of the fabric the same threads may be lapped a different extent.

The lapping of one set of threads a minimum distance, as, for example, from the first needle to the third needle, I believe to increase the normal elasticity of the fabric to a certain extent, but any such lapping would be insufficient for the purpose of my invention which is characterized by the lapping of another set of threads a substantially greater distance and preferably from the first to the fifth needle. Obviously if all the threads were lapped a maximum extent, as, for example, from the first to the fifth needle, the fabric would be too flimsy, and it is only by lapping certain of the threads a minimum distance and the other threads a substantially greater distance that the fabric of my invention is produced.

Having thus described one embodiment of the fabric of my invention and the best mode known to me for practising the method or process thereof, I desire it to be understood that although specific terms are employed, they are used in a generic and descriptive sense and not for purposes of limitation, the scope of the invention being set forth in the following claims.

I claim:

1. A warp knit fabric of substantially uniform texture throughout, and therefore devoid of pillars or partially disconnected wales, said fabric being composed throughout of two sets of threads, one set whereof is throughout the fabric lapped a short distance and the other set whereof is throughout the fabric lapped a markedly greater distance, the length of the set of short laps being materially greater than the width of a knitted loop of the fabric measured transversely of said fabric, and the length of the other set of said laps being markedly greater than said short laps, whereby the threads of the prolonged lap enhance the elasticity, said fabric being of equal thickness throughout and being laterally highly elastic, said fabric being non-raveling and non-running.

2. A warp knit fabric of substantially uniform texture throughout and therefore devoid of pillars or partially disconnected wales, said fabric being non-running and non-raveling and being laterally very highly elastic, said fabric being composed throughout of two sets of threads, one set thereof being throughout the fabric lapped substantially twice the distance of the other set of threads, the length of the set of short laps being materially greater than the width of a knitted loop of the fabric measured transversely of said fabric, and the length of the other set of said laps being markedly greater than said short laps, whereby the prolonged loop enhances the lateral elasticity.

3. That process of making a warp knit fabric that is non-running, non-raveling, and of great lateral elasticity, which includes providing a plurality of warp supplying bars, providing a number of threads equal to the number of needles, lapping one of said bars so as constantly to miss alternate needles only, and lapping the other of said bars constantly to a greater extent whereby the prolonged laps increase the lateral elasticity of the fabric.

4. That process of making a warp knit fabric that is non-running, non-raveling, of uniform thickness throughout and of great lateral elasticity, which includes providing a plurality of warp supplying bars, providing a number of threads equal to the number of needles, lapping one of said bars from the first needle to the third needle throughout, so as constantly to miss the second needle of each series of three and lapping the other of said bars from the first needle to the fifth needle throughout, thereby constantly missing three needles of each series of five, whereby prolonged laps are formed which markedly increase the lateral elasticity of the fabric.

5. That process of making a warp knit fabric that is non-running, non-raveling, of uniform thickness throughout, and of great lateral elasticity, which includes providing a plurality of warp supplying bars, providing a number of threads equal to the number of needles, lapping one of said bars throughout the production of the fabric, so as to miss a minimum number of needles with each thread of one series of threads, and lapping the other of said bars throughout the fabric so as to miss a larger number of needles with each thread of that series of threads.

6. That process of making a warp knit fabric that is non-running, non-raveling, of uniform thickness throughout and of great lateral elasticity, which includes providing a pair of warp supplying bars, providing a number of threads equal to the number of needles, lapping one of said bars throughout the production of the fabric so as to miss the minimum number of needles by each thread of one of the sets of threads, and lapping the other of said bars throughout the fabric so as to miss a larger number of needles by each thread of that series of threads, but causing the lapping threads of both series of threads constantly to extend across and to cover what would otherwise be gaps or openings in the fabric, whereby a fabric of substantially uniform texture and thickness throughout or of a marked degree of lateral elasticity is provided.

In testimony whereof, I have signed my name to this specification.

EARL J. BENNETT.