June 22, 1926. 1,589,474

V. LOMBARDI

KNITTED FABRIC

Filed Jan. 22, 1925

Fig. 1.

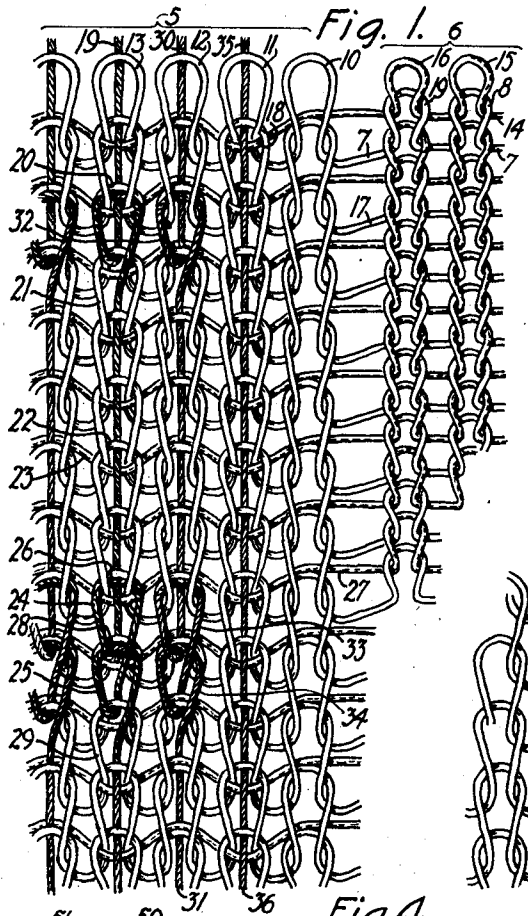


Fig. 2.

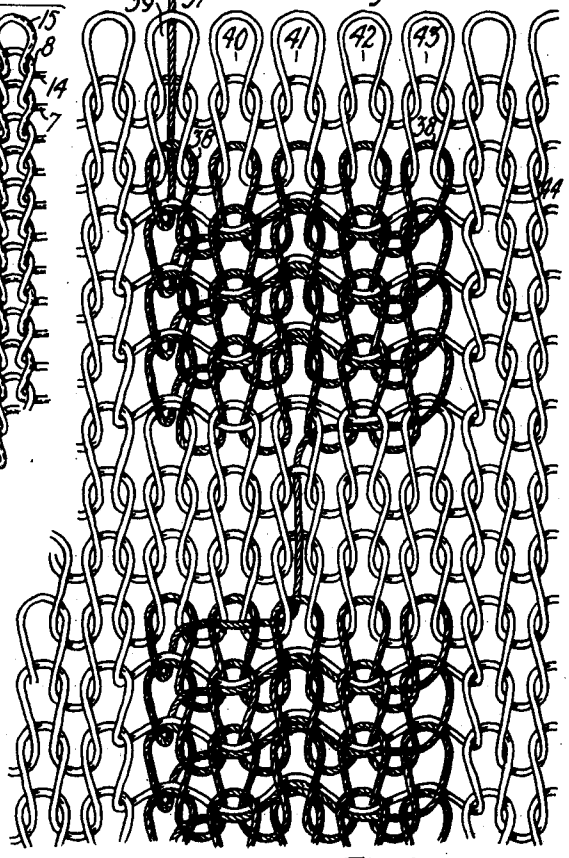


Fig. 4.

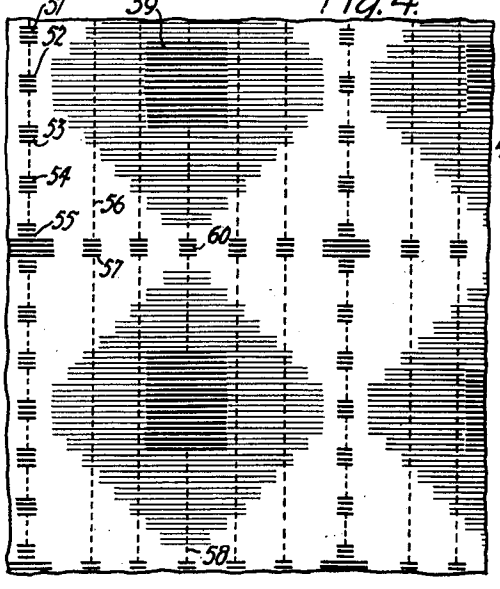
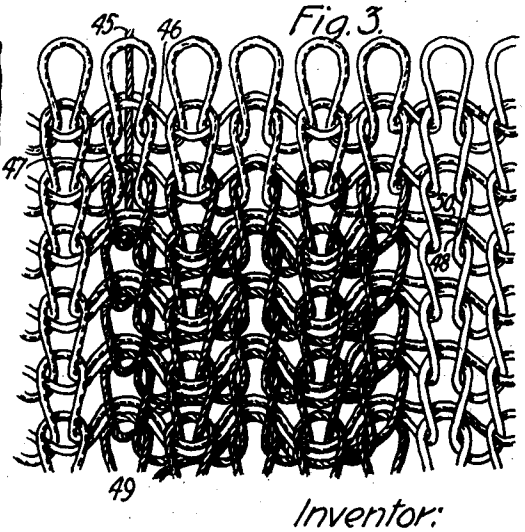


Fig. 3.



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Patented June 22, 1926. 1,589,474

UNITED STATES PATENT OFFICE.

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KNITTED FABRIC.

Application filed January 22, 1925. Serial No. 3,899.

This invention relates to knitted fabrics and more particularly it relates to knitted fabrics in which reinforcing yarns are employed.

An object of the invention is to provide a knitted fabric in which a reinforcing yarn is so arranged with respect to the main portion of the fabric that the tendency for the reinforcing yarn to be caught or pulled out during the wearing of the fabric is considerably reduced.

Another object is to provide a heavy knitted fabric particularly suitable for overcoats or outdoor sport wear and the like.

Another object of this invention is to provide a reinforced fabric, the character of which may be varied to offer many and pleasing designs.

Another object is to provide a combination fabric in which the character of the knitting may be varied from time to time to give stripe effects or other designs.

Another object is to provide a combination fabric, a portion of which may be of the Jersey cloth stitch and another portion of which may be of the interlocked type in which one yarn is interlocked in the rear of the fabric between the loops of another yarn. This interlocked fabric is disclosed and claimed in my United States Patent No. 1,426,576 of August 22, 1922.

One way in which these objects may be accomplished with respect to the reinforcing feature is to arrange the reinforcing yarns in parallel wales and have them frictionally held at a plurality of points. This frictional holding may be accomplished, for example, by causing the reinforcing yarn at desired points to be taken up in the knitting and loops formed thereof which may appear on the front of the fabric and add to the design of the cloth. While this reinforcing yarn may be applied as described with various kinds of cloth such as the so-called Jersey cloth, it is particularly adapted to be used with the so-called interlocked cloth as described in my above mentioned patent. In this interlocked cloth made with two different yarns, for example, the yarn not appearing in the front of the fabric in the form of loops is taken up in the knitting in such a manner that it is interlocked in alternate wales between the loops in successive rows of the other yarn. The reinforcing yarn running at right angles to the rows of loops may, in a manner hereinafter described, be so combined with the other yarns as to give a strong cloth in which sagging will be prevented while still giving body to the cloth.

Referring to the figures, Fig. 1 represents one form of this invention in which the reinforcing yarn is embodied in a cloth, a portion of which is of the so-called interlocked type and loops are formed of the reinforcing yarn at predetermined intervals to aid in the prevention of sagging. Fig. 2 is a modification of Fig. 1 in which the reinforcing yarn is applied to Jersey cloth and each reinforcing yarn is caused to form a plurality of loops in successive wales and rows to vary the design of the fabric; Fig. 3 represents the reinforcing yarn arrangement of Fig. 2 applied to an interlocked fabric; and Fig. 4 illustrates schematically a general design of a fabric which may be produced by suitable combinations of the fabrics of the previous figures.

Referring to Fig. 1, a combination fabric is disclosed having embodied therein a reinforcing yarn in accordance with this invention. The portion 5 of the fabric is of the interlocked type while the portion 6 is of Jersey cloth. Yarn 7 which, by way of example, may be of one type of yarn (hereinafter called type 1) after forming loops 8 and 9 in the Jersey cloth, forms loops 10, 11, 12, 13, etc., of the interlock cloth. Yarn 14 (hereinafter called type 2) which may be of a different type from yarn 7, after forming loops 15 and 16 of the Jersey cloth is interlocked in the back of the portion 5 in alternate wales between the lower ends of the row of loops formed by yarn 7 and the upper ends of the row of loops immediately below formed by yarn 17. For example, the yarn 14 is shown behind the upper end of loop 18 and in front of the lower ends of loop 11 at the right; and at the left is similarly located in front of the lower end of loop 11 and behind the upper end of loop 18. This catches the yarn 14 between the yarns forming the upper and lower ends of these loops and holds yarn 14 in place and not only prevents yarn 14 from being pulled out but also prevents the formation of danging loops on the rear side of the fabric. It will be apparent that this interlocking takes place in alternate wales while in the intervening wales such as the wale in which loop 12 lies, the yarn

14 lies entirely behind the lower end of loop 12 and alongside the tip of the loop in the next row below. The fact that this yarn 14 lies entirely behind the loops in alternate wales and is caught between the loops in the remaining wales gives the maximum interlock effect as described in my above mentioned patent.

The portion 6 of the fabric of Fig. 1 is composed of the Jersey stitch in which each yarn forms loops. This means that there are two rows of loops in the Jersey cloth for each row in the interlocked portion, since in the interlocked portion shown, only the alternate yarns of the Jersey cloth form loops, the others being interlocked as above described behind and between the loops. In still another portion of the interlocked cloth of Fig. 1 it is contemplated, of course, that the yarns which in portion 5 form loops will be interlocked behind loops formed by the yarns which are looped in the portion 5. That is, yarns of type 2, such as yarn 14, would form loops while yarns of type 1, such as yarn 7, would be interlocked. Alternate and unshaded yarns in portion 6 of Fig. 1 are assumed to be of the same type as yarn 7, while the medium shaded ones are assumed to be like yarn 14. Therefore, in portion 6, we have a combination of the two types of yarns, only type 1 is in the front of the fabric in portion 5 and in the additional portion not shown, only type 2 would be in the front. The manner in which this would be done will be readily understood if Fig. 3 were joined to the left of Fig. 1 as will be described hereinafter.

In the interlocked portion 5 of Fig. 1, suitable reinforcing yarns are shown such as yarn 19. Beginning at the top of the fabric, yarn 19 is located behind the loops of the first two rows, but in front of the interlocked yarn 14 in the second row. In the third row of loops, after passing behind loop 20 and in front of the interlocked yarn, it is pulled through the loop in the fourth row to the front of the fabric where a loop is formed thereof superposed on the regular loop 20 for that wale, after which it passes to the rear of the fabric between the two sides of loop 21 in the fourth row, where, for several rows it is caught between the interlocked yarns such as yarn 22 and the top of the loops such as loop 23. Further down the fabric, the yarn 19 forms two successive loops 24 and 25 in adjacent rows in the same manner as the loop in the third row from the top was formed. Thus, after passing between the interlocked yarn 26 and loop 27, it is pulled through loop 28 to the front of the fabric and loop 24 formed, after which it passes around the top of loop 29 to form a second loop and then back to the rear of the fabric.

Reinforcing yarn 30 in the adjacent wale 31 is taken up in the knitting in a somewhat similar manner and is located behind the loop in each row but in front of each interlocked yarn except where it comes to the front to form a loop such as loops 32, 33 and 34. Reinforcing yarn 35 in the next wale 36 is located in a similar manner as yarn 19, except that yarn 35 does not come to the front of the fabric to form loops, at least, not in the portion shown. It has been found entirely feasible to have some of the reinforcing yarns form no loops, as in the case of yarn 35, while other adjacent yarns do form loops to add to the strength of the cloth and its resistance against stretching or sagging. A pleasing pattern may be produced by having the loops of the reinforcing yarns appear at predetermined intervals in the cloth to form either a simple or intricate design.

For example, the loops formed by the reinforcing yarn may occur singly or in different rows separated to an appreciable extent or they may appear in adjacent rows and wales to make square shaped or diamond shaped designs, for example, or to form letters. The reinforcing yarns, therefore, serve a double purpose of increasing the pleasing appearance of the fabric but, of course, their most important function is to prevent the sagging or stretching of the cloth. The formation of loops occasionally by the reinforcing yarns is especially important in supplying the increased friction to any tendency to pull the reinforcing yarns through the fabric.

It is to be noted that there are three types of yarn present in portion 5, one the main loop forming yarn, another the yarn that is interlocked, and third the reinforcing yarn. These three yarns may be of identically the same characteristics and color or they may vary as to size, color or texture as may be desired in any particular instance. In general, the reinforcing yarn may be much larger in size than the other two so that the reinforced parts of the fabric will be much heavier and thicker in appearance. It is to be noted that in passing from the interlocked portion 5 to the Jersey cloth portion 6, the yarns form an open network effect which is quite effective in giving the fabric a pleasing effect. The separation of the two portions 5 and 6 may follow some elaborate pattern so that this open work effect will trace out more or less elaborate designs.

In Fig. 1, the portion 6 of Jersey cloth is not provided with any vertical reinforcing yarns as described for the interlocked portion 5. The Jersey cloth portion may have a reinforcing yarn, however, in the manner illustrated in Fig. 2. In this figure is shown a reinforcing yarn 37 which, if we follow its course beginning at the top of the drawing, continues in one wale behind a plu-

rality of rows until it is brought to the front of the fabric where it forms loops 38 in a plurality of adjacent wales 39 to 43, inclusive. Until it reaches the place where the loops are formed, the yarn 37 alternates in front of and behind the loops of the yarn forming the main portion of the Jersey cloth. After the formation of the loops 38, the yarn 37 then retraces its path back to wale 39 where its first loop is located. In going back, it is interlocked in the alternate wales 42 and 40 between the loops in adjacent rows while it is carried entirely behind the loops in the remaining wales such as wale 41. After wale 39 is reached, the yarn 37 comes to the front of the fabric and forms another row of loops, then it returns and forms another row and so on until the front of the fabric at that point is composed of loops of yarn 37 five loops wide and four rows long. After the formation of the last row, the yarn 37 is brought back only part way to wale 41 after which it resumes a downward course back of wale 41 until it is desired to form on the front of the fabric another series of loops of the reinforcing yarn. It will be understood that the fabric of Fig. 2 may have as many reinforcing yarns as desired, spaced at regular intervals or in any other preferred manner.

It is to be noted that in the region made up of loops of the reinforcing yarn, the yarn which normally would have formed loops in that region is taken to the rear of the fabric where it is interlocked in alternate wales between the loops of adjacent rows and in the remaining wales is carried entirely behind the loops. That is, yarns which normally would have formed loops are interlocked behind the loops of the reinforcing yarn. For example, yarn 44 is interlocked in wales 40 and 42 and is carried behind the loops in wales 39, 41 and 43.

It will be readily understood that the region made up of loops of the reinforcing yarn may be of any size desired and may be made to give any desired pattern effects so as to give a pleasing appearance to the fabric. In Fig. 2 the loops are shown on a somewhat larger scale than the Jersey cloth loops in Fig. 1 for the purpose of illustrating more clearly the course of the reinforcing yarn through the Jersey cloth. It is also to be understood that the Jersey cloth of Fig. 2 may have as many reinforcing yarns as are desired, although only one is shown in the drawing. It is contemplated that the main yarns of the Jersey cloth of Fig. 2 may be all of one color and texture, for example, worsted; while the reinforcing yarns may be of a different color and texture, silk, for example. It is also contemplated that the various reinforcing yarns in the Jersey cloth may be of different colors to add to the pleasing effect.

As just described, Fig. 2 illustrates how one of the reinforcing yarns may come to the front and form a plurality of loops in adjacent wales and rows in a cloth of the Jersey type. Fig. 3 shows how a similar change may be made in a cloth of the interlocked type such as portion 5 of Fig. 1. In Fig. 3, the reinforcing yarn 45 similar to yarn 30 of Fig. 1 passes down behind the fabric being located between the interlocked yarns such as yarn 46 and the loops, such as loop 47, for a plurality of rows after which it takes the place of yarn 48 and forms the five loops shown, while the yarn 48 which ordinarily would have formed loops at this point is interlocked between the upper and lower ends of adjacent rows of loops in alternate wales. Since the reinforcing yarn 45 retraces itself in the interlocked manner back to wale 49 and there is normally in this cloth an interlocked yarn, such as yarn 50, it follows that there are three interlocked yarns in the portion of the fabric where the reinforcing yarn 45 forms loops in the front of the fabric. It is believed apparent from the showing in Fig. 3 the exact course followed by each yarn in forming the special looped section shown.

The fabric of Fig. 3 may be considered as a part of the interlocked fabric of Fig. 1, being a continuation to the left of the interlocked portion 5. The portion to the right of Fig. 3 is composed of the type 1 of yarn, the same as portion 5 of Fig. 1, while the main portion of Fig. 3 is composed of loops of type 2. That is, to the right of Fig. 3 the looped portion is composed of type 1 with type 2 interlocked in the rear of the fabric, while in the main portion of Fig. 3 the loops are of type 2 with type 1 interlocked except at the points where the reinforcing yarn (type 3) forms loops as described.

Fig. 4 illustrates in a schematic manner, a design which may be formed in accordance with this invention. The unshaded portions may be assumed to be Jersey cloth while the medium shaded portions represent interlocked cloth as in Fig. 3 or portion 5 of Fig. 1. The heavy shading represents portions where the reinforcing yarns appear in the front of the fabric and form loops. For example, the dotted line 51 represents a reinforcing yarn which periodically forms a loop in the front of the fabric as at the points 52, 53, 54. At regular intervals as at the point 55, it forms one loop in one row, three loops in the next row, and one loop in a third row before passing to the rear of the fabric, or at this point 55 we may assume it forms three loops in one row, nine loops in a second row and three loops in the next row by way

of example. The yarn 51 in the portion shown, passes through only the Jersey cloth portion and the manner of forming its loops would be the same as for the reinforcing yarn of Fig. 2. Reinforcing yarn 56 passes behind portions of both the interlocked fabric and the Jersey cloth and forms a loop at the point 57 in the Jersey cloth. Reinforcing yarn 58 forms a loop portion 59 of wide area in the interlocked portion in the manner shown in Fig. 3, after which it passes into the Jersey cloth and forms a single loop there at the point 60 and thence into another portion of the interlocked cloth. It will be apparent that this invention makes possible an elaborate and intricate design of pleasing appearance. The other heavy dotted vertical lines in Fig. 4 illustrates other reinforcing yarns spaced a desired number of wales apart. From a consideration of the detailed showings of Figs. 1, 2 and 3, it will be apparent that the reinforcing yarns of Fig. 4 will keep the cloth from sagging and the cloth will also be made heavier without danger of the vertical yarns being pulled through, the loops providing the necessary friction to prevent this.

It has been found convenient to describe the fabrics of Figs. 1, 2 and 3 as if knitting proceeded from the top to the bottom, but as a matter of fact, in knitting these fabrics with a circular knitting machine, the knitting would proceed from the bottom to the top of the portions of the cloth shown. No confusion will, therefore, result if this point is kept in mind. It is also to be understood that the portions shown in Figs. 1 to 4 are merely fragmentary portions of a tubular fabric such as that knitted by circular machines and that the main loop forming yarns are continuous yarns forming without interruption as many circumferentially complete rows of loops as are desired.

It is to be understood that this invention is capable of various embodiments differing substantially from the forms above described without departing in any wise from the spirit of this invention as defined in the appended claims.

What is claimed is:

1. A closely knitted fabric of a plurality of yarns in a single web, certain of said yarns comprising loops in a plurality of wales and a plurality of rows, each wale comprising a loop in each row, and a reinforcing yarn for said fabric extending behind a plurality of said loops parallel to and intermediate the loops of a wale and arranged by frictional engagement with the yarns of said fabric included in said wale to prevent the fabric from sagging.

2. A closely knitted fabric of a single web comprising loops in a plurality of wales and a plurality of rows, a reinforcing yarn for said fabric extending behind a plurality of said loops parallel to a wale, said yarn also forming loops in the front of the fabric at spaced intervals to prevent the fabric from sagging, and means for preventing said reinforcing yarn from becoming a float between the points where it is interlooped.

3. A closely knitted fabric of a single web comprising loops in a plurality of wales and a plurality of rows, a reinforcing yarn for said fabric extending behind a plurality of said loops parallel to a wale for a plurality of rows, said yarn subsequently forming loops in the front of the fabric in a plurality of rows and wales, after which the reinforcing yarn proceeds to the rear of the fabric and extends behind a plurality of loops parallel to a wale for a plurality of rows, and means for preventing said reinforcing yarn from becoming a float between the sections in which it forms loops.

4. A knitted fabric comprising a main yarn forming loops in a plurality of rows and wales, and a reinforcing yarn for said fabric extending behind said loops parallel to a wale for a plurality of rows, said reinforcing yarn subsequently forming loops in the front of the fabric in a plurality of adjacent wales, said reinforcing yarn passing behind its own loops for a plurality of wales parallel to a row and being interlocked in alternate wales in the rear of the fabric between the upper ends of the loops of one row and the lower ends of loops of an adjacent row, after which said reinforcing yarn extends in the rear of the fabric for a plurality of rows parallel to a wale.

5. A knitted fabric according to claim 4, in which at a common point for a certain row and a certain wale, the only loop formed thereat is a loop of the reinforcing yarn.

6. A knitted fabric according to claim 4, in which the main yarn which normally would have formed loops where the loops of the reinforcing yarn are present is instead carried to the rear of the fabric in each row in which the reinforcing yarn forms a plurality of loops in adjacent wales, and is interlocked in alternate wales between the upper ends of the loops of one row and the lower ends of an adjacent row.

7. A knitted fabric according to claim 4, in which the reinforcing yarn is of a different color and texture from the texture and color used in the main yarn portion.

8. A knitted fabric according to claim 4, in which the reinforcing yarn in its path in the rear of the fabric parallel to a wale is taken up in the knitting in the rear of the fabric in at least alternate rows.

9. A knitted fabric according to claim 4, in which the reinforcing yarn in its path in the rear of the fabric parallel to a wale passes to the rear of the top of a loop in

one row and in front of the top of the loop in the next adjacent wale and soon throughout its course in the rear of the fabric.

10. A closely knitted fabric of a single web comprising a plurality of independent yarns, one portion of said fabric comprising loops of one yarn with a second yarn interlocked in alternate wales of the fabric between the loops of adjacent rows of first yarn, another portion comprising loops of the second yarn with the first yarn interlocked in alternate wales of the fabric between the loops of adjacent rows of the second yarn, adjacent loops of each row being in a substantially parallel relation, and a reinforcing yarn running parallel to and intermediate the sides of the loops of a wale of said fabric for a substantial distance in the rear of the fabric and arranged by frictional engagement with the yarn portions of said wale of the fabric to prevent the fabric from sagging.

11. A knitted fabric according to claim 10, in which the reinforcing yarn in at least one point in the fabric forms a loop in the front thereof.

12. A knitted fabric according to claim 10, in which the reinforcing yarn extends behind said loops parallel to a wale for a plurality of rows, said reinforcing yarn subsequently forming loops in the front of the fabric in a plurality of adjacent wales, said reinforcing yarn passing behind its own loops for a plurality of wales parallel to a row of loops and being interlocked in alternate wales in the rear of the fabric between the upper ends of the loops of one row and the lower ends of loops of an adjacent row, after which said reinforcing yarn extends in the rear of the fabric for a plurality of rows parallel to a wale.

13. A knitted fabric comprising the usual looped yarns in a plurality of wales and a reinforcing yarn running parallel to the direction of a wale and being located at least in the major portion of its course behind a plurality of said loops and intermediate the sides of the loops of that wale, said reinforcing yarn in each row being located between yarn portions of said wale to maintain said reinforcing yarn in said fabric.

14. A knitted fabric having portions of different characteristics, one of said portions comprising independent yarns, one of the yarns forming the usual loops in a plurality of rows and wales, another of said yarns being located in the rear of the fabric for a substantial distance, being interlocked in alternate wales between the upper ends of the loops in one row and the lower ends of loops in an adjacent row, while being carried entirely behind the fabric in the remaining wales, another portion of said fabric comprising Jersey cloth in which said two yarns in turn form rows of loops in the front of the fabric.

15. A knitted fabric, according to claim 14, in which a third independent yarn running parallel to a wale is taken up in the knitting for preventing the fabric from sagging.

16. A knitted fabric, according to claim 14, in which a third independent yarn is present in the Jersey cloth running parallel to a wale for a substantial distance in the rear of the fabric, being located in alternate rows in front of the regular loops and in the remaining rows being located behind the regular loops, said third yarn in another part of its course forming loops in the front of the fabric in a plurality of adjacent rows and wales where said third yarn is interlocked in alternate wales in the rear of the fabric between its own loops.

In witness whereof, I hereunto subscribe my name this 19th day of January, A. D., 1925.

VINCENT LOMBARDI.